Fishery Data Series No. 05-18

Production and Spawning Distribution of Coho Salmon from the Chilkat River, 2002–2003

by

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and

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May 2005

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Department of Fish and Game	ADF&G
Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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ABSTRACT

The purpose of this study was to conduct a full stock assessment of Chilkat River coho salmon *Oncorhynchus kisutch*. Coho salmon smolt were captured in the Chilkat River during spring 2002, marked with an adipose fin clip and a coded wire tag (CWT), and sampled for age, weight, and length. Adult coho salmon were sampled for CWTs in recreational and commercial fisheries harvests throughout Southeast Alaska during 2003. Adult coho salmon were sampled in the Chilkat River to determine the marked fractions. In addition, the inriver abundance of coho salmon to the Chilkat River in 2003 was estimated by using a mark-recapture experiment. Fish were marked in the lower Chilkat River and later sampled upriver for marks. The spawning distribution was estimated by radio tagging a subsample of the fish caught in the lower river with radio transmitters and tracking these fish upriver.

We estimated that 1,696,212 (SE = 190,330) coho salmon smolt emigrated from the Chilkat River in 2002. Most (81.3%, SE = 2.2%) of the smolt emigrating were age-1. The total (nonjack) run of Chilkat River coho salmon in 2003 was estimated at 219,291 (SE = 16,588), of which 83,302 (SE = 6,956) were harvested in marine fisheries, and 135,989 (SE = 15,067) immigrated into the Chilkat River during 2003. Most (60.0%) of the harvest occurred in the commercial troll fishery (51,794, SE = 6,369). The majority of the escapement (118,387, SE = 10,112) was age-1.1 (2000 brood year), and male (82,099, SE = 10,048). The marine survival rate (smolt-to-adult) was estimated at 12.9% (SE = 1.7%) and marine exploitation rate at 38.0% (SE = 3.3%) for this stock.

All radio tagged fish resumed upstream movement after tagging, however one subsequently backed out and spawned in another drainage. We estimated that 91.5% (SE = 3.4%) of the coho salmon that entered the lower Chilkat River successfully spawned in the drainage. We identified nine major spawning areas (≥5%) within the Chilkat River drainage.

Key words: abundance, escapement, spawning distribution, radio telemetry, mark-recapture, coded wire tag, harvest, contribution, subsistence fishery, recreational fishery, troll fishery, drift gillnet fishery, seine fishery, age composition, size composition, sex composition, length-at-age, marine survival, exploitation rate, coho salmon, *Oncorhynchus kisutch*, Chilkat River, Haines, Southeast Alaska

INTRODUCTION

The purpose of this study was to conduct a full stock assessment of Chilkat River coho salmon *Oncorhynchus kisutch*. The long-term goal of this study is to gather information needed to manage harvests in accordance with sustained yield principles.

The Chilkat River is the third or fourth largest producer of coho salmon in Southeast Alaska (Scott McPherson, Alaska Department of Fish and Game, Douglas, personal communication). Research conducted during the 1980s on coho salmon stocks in Lynn Canal (including the Chilkat River), concluded that these stocks have, at times, been subjected to very high (over 85%) exploitation rates (Elliott and Kuntz 1988, Shaul et al. 1991).

The Chilkat River is a large glacial system that originates in British Columbia, Canada, flows through rugged dissected mountainous terrain, and terminates in Chilkat Inlet near Haines, Alaska (Figure 1). The mainstem and major tributaries comprise approximately 350 km of river channel in a watershed covering about 2,600 km² (Bugliosi 1988).

The freshwater coho salmon fishery in Haines provides a small but important component of the local economy. In 1988, anglers fishing in Haines and Skagway for coho salmon spent an estimated $181,000 (Jones & Stokes 1991). This fishery operates late in the year when other fisheries have finished and is equally popular with local and non-local anglers—63% of anglers who fished in fresh water areas of Haines during 2002 were nonresidents (Jennings et al. *in prep*.). The Chilkat River produces most of the coho salmon harvested in Haines area recreational fisheries and supports one of the largest freshwater coho fisheries in the Southeast region, with an average annual harvest of about 1,600 coho salmon over

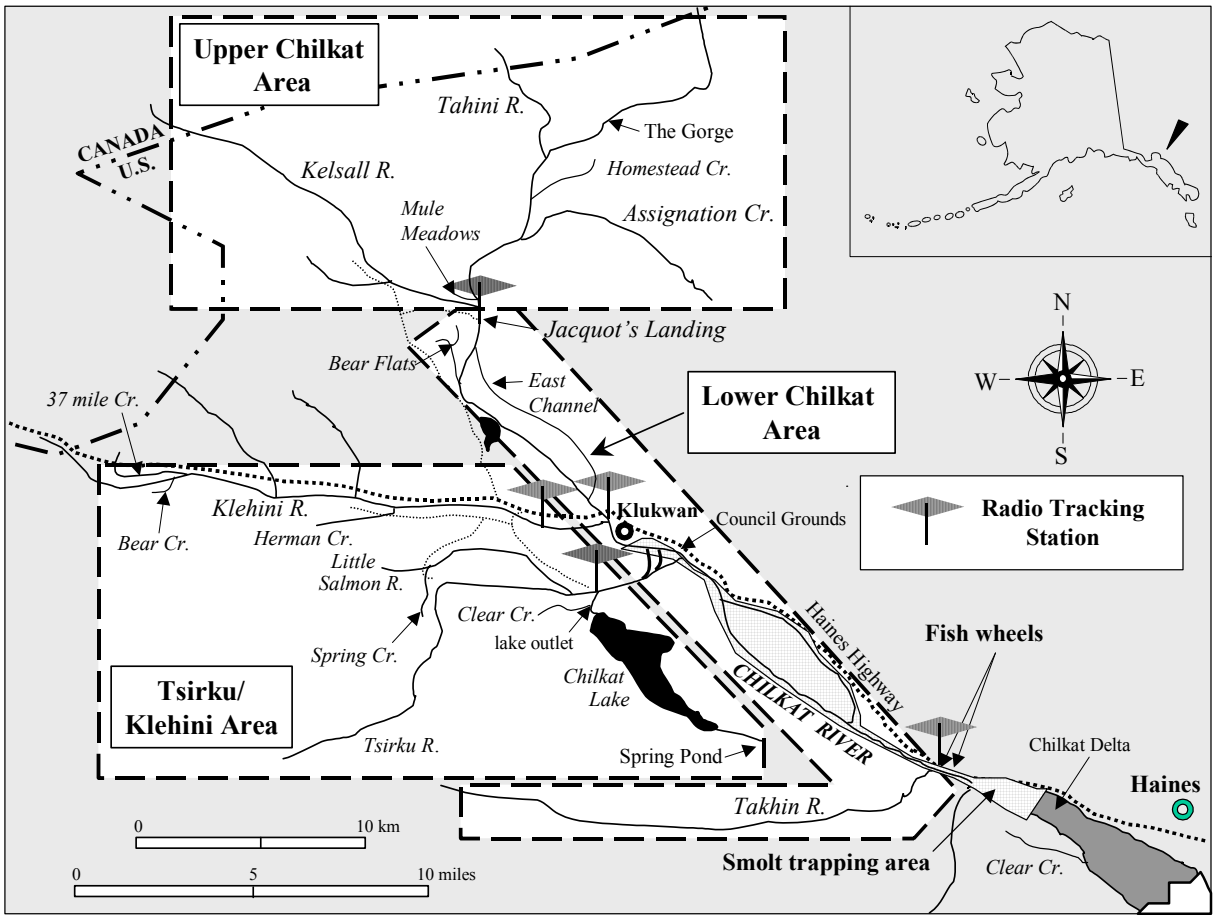


Figure 1.–The Chilkat River drainage, showing location of sampling sites.

the past five years (Howe et al. 2001a, b, Jennings et al. *In prep.*, Walker et al. 2003). This stock also contributes a significant number (more than 40,000 per year) of fish to the commercial troll, gillnet, and seine fisheries in northern Southeast Alaska (Elliott and Kuntz 1988, Shaul et al. 1991, Ericksen 2001; 2002; 2003).

The current management program for Chilkat River coho salmon relies on monitoring of spawning escapements on four index streams: Clear Creek, Spring Creek, Tahini River, and Kelsall River (Figure 1). Alaska Department of Fish and Game (ADF&G) personnel survey the index streams by foot or boat on a weekly basis during peak spawning and count the number of adult coho salmon. The peak number counted for each stream is used as the index count for that year. The escapement of coho salmon to the Chilkat River drainage has been estimated for 3 years (1990, 1998, and 2002). The estimated escapement was 80,700 (SE = 9,984, Dangel et al. Unpublished) in 1980, 37,132 (SE = 7,432, Ericksen 1999) in 1998, and 209,311 (SE = 26,587, Ericksen 2003) in 2002.

Radio telemetry studies in the Unuk River (Weller et al. 2002; Weller et al. 2003) and in other systems have shown that a significant proportion of coho salmon that were handled in the first event of a mark-recapture study did not continue upriver movement. Inserting radio transmitters in a representative sample of coho salmon caught in the lower Chilkat River fish wheels allowed us to estimate the distribution of spawning coho salmon among Chilkat River tributaries and mainstem areas as well as the proportion of coho salmon that avoid subsequent upriver migration in the Chilkat River.

This was the fourth consecutive study designed to monitor the cycle of smolt production and subsequent adult harvest of Chilkat River coho salmon. During the first three cycles, 1.2 – 3.0 million smolt emigrated from the Chilkat River and contributed 41,000 – 114,000 adults to commercial, sport, and subsistence fisheries (Ericksen 2001; 2002; 2003). Research objectives for this study were to:

1. estimate the number of coho salmon smolt leaving the Chilkat River in 2002;
2. estimate the age composition of coho salmon smolt leaving the Chilkat River in 2002;
3. estimate the escapement of coho salmon to the Chilkat River in 2003;
4. estimate the age, sex and length composition of large adult coho salmon entering the Chilkat River in 2003;
5. estimate the marine harvest of Chilkat River coho salmon in 2003;
6. estimate the proportion of coho salmon that failed to move upstream after being marked in the lower Chilkat River; and,
7. identify major coho salmon spawning areas within the Chilkat River drainage.

METHODS

Coho salmon smolt were captured in the mainstem of the Chilkat River during spring 2002 and marked with an adipose fin clip and a coded wire tag (CWT). Adult coho salmon were sampled for CWTs in recreational and commercial fisheries harvests throughout Southeast Alaska in 2003. In addition, returning adult coho salmon were sampled in the Chilkat River in 2003 to determine the marked fraction for estimating the 2002 coho smolt emigration and the marine harvest of adult coho salmon in sampled fisheries in 2003.

We used a mark-recapture experiment to estimate the number of adult coho salmon returning to the Chilkat River in 2003. Marks were applied to coho salmon captured in the lower Chilkat River from August 1 through October 21, between the area adjacent to Haines Highway miles 8 and 9 (Figure 1). Coho salmon were marked with a uniquely numbered solid-core spaghetti tag and a hole punch in the upper left operculum prior to release. We also radio tagged a sub-sample of the fish caught. Fish were examined for marks on spawning tributaries of the Chilkat River between September 29, 2003 and January 23, 2004. The marked to unmarked ratio was used to estimate abundance. Radio tagged fish were tracked to document failure to move upstream (e.g. handling mortality or back-outs), and spawning distribution.

SMOLT CAPTURE, SAMPLING, AND MARKING

Smolt were captured in the mainstem of the Chilkat River from the airport upstream to approximately Haines Highway milepost (MP) 21 during spring 2002 (Figure 1). Two crews of two people fished an average of 80 G-40 minnow traps per day between April 9 and May 29. Traps were baited with disinfected salmon roe and checked at least once per day. Crew members immediately released obviously undersized or non-target species at the capture site. Remaining fish were transported to holding boxes for processing at the tagging site located on the bank of the Chilkat River MP 19. Water depth (cm), and temperature (°C) were recorded each morning near the tagging site.

All healthy juvenile coho ≥75 mm fork length (FL) were marked with an adipose fin clip and given a CWT following the methods in Koerner (1977). Fish were first tranquilized in a solution of tricain-methane sulfanate (MS 222) buffered with sodium bicarbonate. All Chinook salmon smolt ≥50 mm were also marked as above using a separate tag code.

All marked smolt were held overnight to check for 24-hour tag retention and handling induced mortality. The following morning 100 fish in the previous day's catch were checked for the retention of CWTs and mortality. If tag retention was 98/100 or greater, mortalities were counted and all live fish from that batch were released. If tag retention was less than 98/100, the entire batch of smolt was checked for tag retention and those that tested negative were re-tagged. The number of fish tagged, number of tagging-related

mortalities, and number of fish that had shed their tags were compiled and submitted to the Commercial Fisheries Division (CFD) Tag Lab in Juneau at the completion of the field season.

Every 75th coho salmon smolt tagged was measured to the nearest mm FL, weighed to the nearest g, and scale sampled (for age). Twelve to 15 scales were taken two rows above the lateral line on the left side of each sampled smolt just ahead of the adipose fin (Scarnecchia 1979). Scales were mounted individually between two 25 mm × 75 mm glass slides and viewed through a microfiche reader at 70× magnification. Age was determined once for each fish and reported in European notation. In addition, coho salmon smolt were captured by Northern Southeast Regional Aquaculture Association (NSRAA) personnel between May 19 and June 23, 2002 as they emigrated from Chilkat Lake. Twenty smolt each day were sampled for length, weight, and scales from this site between May 22 and June 16. The results from this project are presented here for comparison.

LOWER RIVER ADULT SAMPLING AND MARKING

Returning coho salmon were captured in fish wheels operating adjacent to MP 9 (Figure 1) during 2003. CFD personnel installed two 3-basket aluminum fish wheels in early June to estimate escapement of coho, sockeye *O. nerka*, Chinook *O. tshawytscha*, and chum salmon *O. keta*, to the Chilkat River. One fish wheel operated adjacent to MP 9, and the other about 300 m downstream of the first. The fish wheels were operated continuously from June 6 through October 21, except for maintenance. The number of hours each wheel operated was recorded daily. The wheels were located along the east bank of the river where the main flow was constrained primarily to one side of the floodplain. Water depth (cm), and temperature (°C) were recorded each morning near MP 8.

Captured coho salmon were visually examined to estimate sex, measured to the nearest mm MEF, and inspected for missing adipose fins. A scale sample was systematically collected from every third coho salmon captured through September 7, and from every fifth coho salmon from September 8 to October 21. Five scales were removed from the left side of the fish, along a line 2 to 4 scale rows above the lateral line between the posterior insertion of the dorsal fin and anterior insertion of the anal fin. Ages were determined from patterns of circuli according to protocols in Mosher (1968).

Coho salmon captured in good condition (not directly injured during capture) were marked with a uniquely numbered solid-core spaghetti tag sewn at the posterior end of the dorsal fin through the pterygiophores and had a ¼-inch hole punched in the upper edge of the left operculum prior to release. In addition, a subsample of the marked fish was also given a radio tag as described in the Radio Telemetry section. Beginning August 24, coho salmon were also given a temporal mark (alternating clips to the left and right pectoral fin or axillary appendage clip) to allow the abundance estimate to be stratified over time in the event of significant tag loss. On days when coho catches exceeded the number that could be processed as above, the fish wheel crew sampled as many as they could and released the remainder unmarked. These unmarked fish were counted, classified as jack (less than 350 mm) or large, and examined for missing adipose fins prior to release.

Fish wheel personnel retained heads from all coho salmon missing adipose fins and a plastic cinch strap with a unique number was inserted through the jaw of the head. Heads and CWT recovery data were sent to the ADF&G CWT Processing Laboratory in Juneau where any tags present were removed, decoded, and corresponding information entered into the lab database.

SPAWNING GROUND RECOVERY

Coho salmon in thirteen (13) spawning tributaries were sampled for marks by two teams of two people from October 2 to November 30. Sampling continued through January as time and personnel allowed. In addition, coho salmon were caught by NSRAA personnel sampling sockeye salmon at the Chilkat Lake weir from September 29 through October 10. The sampling sites were initially classified into three distinct areas based upon similar studies conducted in 1998 and 2002 (Figure 1, Ericksen 1999; 2003). The Upper Chilkat area was sampled October 2

to November 12. The Tsirku/Klehini area was sampled September 29 to January 23. The Lower Chilkat area was sampled October 24 to December 29. Coho salmon were captured with gillnets, seine nets, dip nets, snagging gear, and bare hands. All coho salmon were examined for marks and missing adipose fins, measured for length (MEF in mm), and sexed. Double sampling was prevented by punching a hole in the lower edge of the left operculum of all fish sampled during recovery efforts.

ABUNDANCE ESTIMATES

A two-event mark-recapture experiment was used to estimate the abundance of coho salmon smolt (N_s) emigrating from Chilkat River in 2002. The number of smolt marked during spring 2002 defined the first sampling event. Sampling returning adults for missing adipose fins during fall 2003 defined the second sampling event.

Smolt abundance (number emigrating) of coho salmon smolt was estimated using the Chapman's modified Petersen estimator for a closed population (Seber 1982):

$$\hat{N}_s = \frac{(n_1+1)(n_2+1)}{(m_2+1)} - 1 \qquad (1a)$$

$$\text{var}[\hat{N}_s] = \frac{(n_1+1)(n_2+1)(n_1-m_2)(n_2-m_2)}{(m_2+1)^2(m_2+2)} \qquad (1b)$$

where n_1 is the number of smolt marked in the spring of 2002, n_2 is the number of age-1.1 and -2.1 coho salmon captured in the Chilkat River fish wheels in 2003, and m_2 is the subset of n_2 which had been marked as coho smolt in 2002.

The escapement of coho salmon to the Chilkat River in 2003 (N_e) was also estimated using the Petersen model, if assumptions of the model were met (i.e., stratification by time of marking and/or recapture area was not required). A Darroch model (Seber 1982) was used otherwise.

The validity of the Petersen mark-recapture experiment rests on several assumptions: (a) that every fish has an equal probability of being marked during event 1, that every fish has an equal probability of being captured in event 2, or that marked fish mix completely with unmarked fish; (b) that recruitment and "death" (emigration) do not both occur between sampling events; (c) that marking does not affect catchability (or mortality) of the fish; (d) that fish do not lose marks between sample events; (e) that all recovered marks are reported; and (f) that double sampling does not occur (Seber 1982).

The validity of assumption (a) was tested through a series of hypothesis tests ($\alpha = 0.10$). First, the possibility of selective sampling was investigated because assumption (a) could be violated if the sampling rate varied by size of the fish. The hypothesis that fish of different sizes were captured with equal probability was tested with a Kolmogorov-Smirnov (K-S) 2-sample test comparing the size distribution of marked fish with those recaptured. If selective sampling was apparent the abundance estimate could be stratified by size and/or by sex. Next, an R×2 contingency table (chi-square statistic) was used to test the hypothesis that fish marked during R marking periods were recaptured at the same rate. Finally, a 2×C contingency table was used to test the hypothesis that fish sampled at C spawning tributaries were marked at the same rate. If either of these last two hypotheses was accepted, a simple Petersen model was appropriate to estimate abundance; otherwise a Darroch estimator was considered appropriate. If a Darroch model was needed, temporal and/or geographical strata were pooled to find admissible (non-negative) estimates, reduce the number of parameters, and increase precision while finding no evidence of lack of fit (Arnason et al. 1996). Two main points were considered when pooling strata: the similarity of the fractions of fish marked (for recovery strata) and the similarity of recovery fractions (for marking strata). Pooling of neighboring strata (temporal periods, or adjoining or adjacent stream reaches) was also considered to remove redundancy and to develop an intuitive basis for pooling. Other assumptions are considered in the Discussion section.

AGE, SEX, AND SIZE COMPOSITIONS

Age composition of coho salmon smolt in 2002 and age and sex compositions of adults in 2003 were estimated from systematically drawn samples as described above. Sex and length compositions were tabulated separately for adult

fish in the lower river and in each escapement sampling area. Standard sample summary statistics were used to calculate estimates of mean length- and mean weight-at-age and their variances (Cochran 1977).

Size and sex selectivity was investigated by comparing the numbers of coho salmon by size and sex captured in the lower river and spawning ground samples with contingency table analysis (α = 0.10). Age (or sex) composition of the escapement was obtained from pooled samples when no selectivity was found or from separate unbiased samples as appropriate. Proportions in the age [or sex] compositions and their variances were estimated as

$$\hat{p}_a = \frac{n_a}{n} \tag{2a}$$

$$\text{var}[\hat{p}_a] = \frac{\hat{p}_a\ (1-\hat{p}_a)}{n-1} \tag{2b}$$

where n is the number of successfully aged (or sexed) fish and n_a is the subset of n determined to be age (or sex) a.

The abundance of sex s coho salmon by size class c in the escapement was estimated as:

$$\hat{N}_{c,s} = \hat{N}_c\ \hat{p}_{c,s} \tag{3a}$$

$$\text{var}[\hat{N}_{c,s}] = \text{var}[\hat{p}_{c,s}]\hat{N}_c^{\,2} + \text{var}[\hat{N}_c]\hat{p}_{c,s}^{\,2} - \text{var}[\hat{p}_{c,s}]\,\text{var}[\hat{N}_c] \tag{3b}$$

where $\hat{N}_c$ is the estimated inriver abundance of size class c coho salmon. The abundance of age a coho salmon by sex in the escapement $\hat{N}_{c,s,a}$ was estimated by substituting $\hat{N}_{c,s}$ and $\hat{p}_{c,s,a}$ for $\hat{N}_c$ and $\hat{p}_{c,s}$ in equations 3a and 3b.

HARVEST

Harvest in 2003 of coho salmon originating from the Chilkat River was estimated from fish sampled for CWTs from catches in marine commercial and recreational fisheries and in the Chilkat River escapement for determining the tagged fraction θ_h.

The Southeast Alaska Commercial Fisheries Division Port Sampling program sampled landings from commercial drift gillnet, set gillnet, purse seine, and troll fisheries throughout Southeast Alaska and Yakutat. During summer and early fall, samplers were stationed at processors in Ketchikan, Craig, Wrangell, Petersburg, Sitka, Pelican, Port Alexander, Elfin Cove, Excursion Inlet, and Juneau. The sample goal was to inspect at least 20% of the total catch of Chinook and coho salmon for missing adipose fins. Heads from fish missing their adipose fin were sent to the Coded Wire Tag laboratory in Juneau on a weekly basis where CWTs were removed and decoded, and the resulting information compiled.

The annual Commercial Fisheries Port Sampling manual (Oliver Unpublished) provides a detailed explanation of commercial catch sampling procedures and logistics.

Because several fisheries exploited coho salmon over several months in 2003, harvest was estimated over several strata, each a combination of time, area, and type of fishery. Statistics from the commercial troll fishery were stratified by fishing period and by fishing quadrant. Statistics from drift gillnet fisheries were stratified by week and by fishing district. Statistics from the recreational fishery were stratified by fortnight. Hubartt et al. (1997) describe methods of sampling recreational fisheries in Southeast Alaska. Since there was no on-site sampling in the Haines area, the estimated harvest of Chilkat River coho salmon in the Haines marine and Chilkat River sport fisheries came from the Sport Fish Division's postal Statewide Harvest Study (SWHS). Harvests within the Chilkat River drainage were identified in the SWHS and summed to estimate the total inriver coho salmon harvest. The marine sport fishery estimates were restricted to locations in the SWHS near the terminus of the Chilkat River and all coho salmon harvested within these locations were assumed to be of Chilkat River origin.

Data from the catch and field sampling programs were used to estimate the harvest of coho salmon bound for the Chilkat River $\hat{r}_i$ and its variance (by stratum) using the procedures in Bernard and Clark (1996). Estimates of harvest were summed

across strata and across fisheries to obtain an estimate of the total $\hat{T}$:

$$\hat{T} = \sum_i \hat{r}_i \quad (4a)$$

$$\text{var}[\hat{T}] = \sum_i \text{var}[\hat{r}_i] \quad (4b)$$

Variance of the sum of estimates was estimated as the sum of variances across strata because sampling was independent across strata and across fisheries.

A subset n_i of the catch in each stratum was counted and inspected to find recaptured fish. Of those inspected, a_i salmon were missing their adipose fin and had their heads sent to Juneau for dissection. Of the a_i' heads that arrived in Juneau, all were passed through a magnetometer to detect a CWT. Of the t_i tags detected, t_i' were successfully decoded under a microscope of which m_{ci} were identified as Chilkat River releases.

The mean date of harvest for a commercial fishery was estimated as (Mundy 1982):

$$\hat{\bar{d}} = \sum_{d=1}^{n} d\hat{P}_d \quad (5)$$

where P_d is the proportion of harvest on day d:

$$\hat{P}_d = \frac{\hat{H}_d}{\sum_d H_d} \quad (6)$$

and where $\hat{H}_d$ is the estimated number of Chilkat River coho salmon harvested on day *d*.

RUN SIZE, EXPLOITATION RATE, AND MARINE SURVIVAL

Run size (harvest plus escapement) of coho salmon returning to the Chilkat River in 2003 was estimated as:

$$\hat{N}_R = \hat{T} + \hat{N}_e \quad (7a)$$

$$\text{var}\left[\hat{N}_R\right] = \text{var}\left[\hat{T}\right] + \text{var}\left[\hat{N}_e\right] \quad (7b)$$

The fraction of the run harvested (the exploitation rate) was calculated as:

$$\hat{E} = \frac{\hat{T}}{\hat{N}_R} \quad (8a)$$

$$\text{var}[\hat{E}] \approx \frac{\text{var}[\hat{T}]\hat{N}_e^2}{\hat{N}_R^4} + \frac{\text{var}[\hat{N}_e]\hat{T}^2}{\hat{N}_R^4} \quad (8b)$$

where the variance is an approximation from the delta method (Seber 1982).

The estimated marine survival rate (smolt to adult) and the delta method approximation of its variance was calculated as:

$$\hat{S} = \frac{\hat{N}_R}{\hat{N}_s} \quad (9a)$$

$$\text{var}[\hat{S}] \approx \hat{S}^2\left[\frac{\text{var}[\hat{N}_R]}{\hat{N}_R^2} + \frac{\text{var}[\hat{N}_s]}{\hat{N}_s^2}\right] \quad (9b)$$

RADIO TELEMETRY

Model 1845 internal radio transmitters manufactured by Advanced Telemetry Systems (ATS) were placed in 123 coho salmon that were handled and marked identically to the other spaghetti-tagged coho salmon in the mark-recapture experiment. Due to concerns about small stomachs not being able to withstand radio transmitter insertion, coho salmon less than 450 mm MEF were not selected for radio tagging. The original 120 radio transmitters were deployed over an 11-week period in proportion to historical fish wheel catches, and three radio transmitters that were recovered from fisheries were redeployed opportunistically.

Movement of the radio tagged coho salmon in the mainstem Chilkat River and into tributaries was tracked using stationary receivers, aerial surveys, and ground surveys. The fates of individual fish were tallied to estimate the proportion of the sample that continued upstream migration into the mark-recapture study area and the proportion of fish that spawned in concentrated areas.

The radio transmitters used were pulse-coded (Eiler 1995) in the 150 MHz frequency range. Internal radio transmitters were used to avoid the physical drag caused by external tags. A 12 mm-

diameter plastic tube was used to gently push the radio transmitter body through the esophagus until it was seated in the stomach. Proper placement of each tag was verified before release by looking into the fish's mouth to see that the radio transmitter antenna protruded from the center of the esophagus into the oral cavity. Anesthesia was not used during the tagging procedure and coho salmon were released immediately after tagging.

Each transmitter emitted a unique signal and was equipped with a motion sensor and activity monitor (Eiler 1990). The motion sensor generated additional signal pulses distinct from the basic signal pattern each time the transmitter moved. The signal pattern changed from an active to inactive mode if the motion sensor was not triggered for over 24 hours; the signal reverted to the active pattern if the motion sensor was triggered again. Minimum battery life for the implanted transmitters was specified as 177 days.

Tracking stations at five locations were used to record movements of the radio-tagged salmon (Figure 1). Each station consisted of an ATS R4500C integrated receiver and data logger, two directional Yagi antennae (one aimed upstream and one aimed downstream), and a solar panel and battery power system. The stations were placed with a clear view for both the downstream and upstream antennae to maximize the transmitter reception range. Radio-tagged fish within reception range of the stations were identified and recorded. The ability of each remote tracking station to detect and record the passage of radio-tagged fish was verified by placing radio transmitters in the water in the possible migration routes past the tracking stations. The information collected at the stations included the date and time that each radio transmitter was identified, the antenna (upstream, downstream, or both combined), the signal strength, and the activity pattern (active or inactive) of the transmitter. The location of each transmitter relative to the station (upriver or downriver from the site) was deduced by comparing upstream and downstream antenna signal strengths. A constant signal from a reference transmitter near each tracking station was received and recorded to verify that the station components were functioning properly and to identify when the equipment stopped functioning in the case of failure. Tracking station data files were downloaded weekly using a notebook computer.

The first tracking station encountered by tagged fish was located at MP 9, adjacent to the more upstream of the two fish wheels used for coho salmon capture and tagging (Figure 1). This station served as a gateway for radio-tagged coho salmon entering and possibly leaving the study area, and was operated from August 13 until December 3. To discriminate between fish holding near the tagging site after being tagged and fish that had resumed upriver movement, upstream passage at the MP 9 tracking station was defined as the time when the upstream antenna signal strength became 20 decibels (dB) greater than the downstream antenna signal strength and the upstream signal subsequently remained stronger than the downstream signal. Radio transmitter testing showed that fish were approximately 800m upstream of the MP 9 tracking station when the 20dB difference was achieved.

Four tracking stations monitored movement in upriver locations (Figure 1). One station covered the Chilkat River at Wells Bridge, from August 14, 2003 through February 17, 2004. A second tracking station covered the Chilkat River at Jacquot's Landing from August 15 until October 9. A third tracking station monitored the Chilkat Lake outlet stream from August 18 until October 23. On October 23, 2003, this station was relocated to cover the Tsirku River downstream of the confluence with the Chilkat Lake outlet stream and was operated there until February 23, 2004. A fourth tracking station covered the Klehini River from September 10 through December 2. Upstream passage at these four tracking stations was defined as the time when the upstream antenna signal strength became and remained stronger than the downstream antenna signal strength.

We flew aerial radio tracking surveys of the Chilkat River drainage biweekly from September through November, then monthly through January 2004. Surveys were conducted from slow flying fixed-wing aircraft equipped with either one or

Table 1.–Criteria used to assign fates to radio tagged coho salmon, Chilkat River, 2003.

Fate	Criteria
Pre-spawning Mortality or Tag Regurgitation	A fish whose radio transmitter either never advanced upstream after tagging, or was located in the mainstem Chilkat River broadcasting in the mortality mode over at least 2 surveys, was never tracked to a spawning location in the river, and wasn't reported as harvested in a fishery.
Fishing Mortality	A fish reported as harvested in a sport or subsistence fishery.
Backout	A fish whose transmitter was tracked downstream from the tagging site and was never tracked to a spawning location in the Chilkat River.
Probable Spawning in a Tributary	A fish whose radio transmitter was tracked into a tributary, and remained in or was tracked downstream from that location. When a transmitter is tracked to more than one tributary, the last tributary was assumed to be the spawning location.
Probable Spawning in the Mainstem	A fish whose radio transmitter was tracked upstream (first observation, if the highest observed, was not in the mortality mode), observed in a mode other than the mortality mode near its highest observed location, then observed in a downstream location.
Unknown	A fish whose radio transmitter was rarely located (two weeks or less, never in a tributary), and/or does not fit into the other categories. These tracking histories are typically uninformative, or suggestive of more than one possible fate.

two R4500C receivers and two directional antennae aimed to the left and right of the flight path. When two R4500C receivers were used, the list of transmitter frequencies was divided between receivers to reduce scan cycle time. In addition to the Chilkat River drainage, the December 4 aerial survey covered the Chilkat River downstream of the tagging site and the perimeter of Chilkat Inlet. Positions of radio tagged fish were estimated to the nearest river km, (RKM) as counted moving upstream from the mouth of the river in which the transmitter was located.

Radio tracking surveys by boat, on foot, and by road were begun in early October to provide closer observations of radio-tagged coho salmon and to recover radio transmitters from post-spawning fish. Tracking and recovery of radio transmitters continued as staff time allowed through June 2004.

We used data from tracking stations, aerial surveys, and ground surveys to assign each radio tagged fish one of five possible fates based on criteria found in Table 1.

The radio telemetry study was adjusted to compensate for non-proportional tagging. Numbers of coho salmon caught X and radio-tagged x, the hours of actual fish wheel operation h, and possible hours of fish wheel operation H were recorded each day. The count of fish tagged in stratum i having fate j $\left(R_{ij}\right)$ was adjusted as:

$$Y_{ij} = \frac{X_i H_i}{x_i h_i} R_{ij} \tag{10}$$

The proportion of fish that met each fate was estimated as:

$$\hat{q}_j = \frac{\sum_{i}^{\text{strata}} Y_{ij}}{\sum_{j}^{\text{fates}} \sum_{i}^{\text{strata}} Y_{ij}} \tag{11}$$

Standard errors of $\hat{q}_j$ were approximated by Bayesian posterior standard deviations obtained

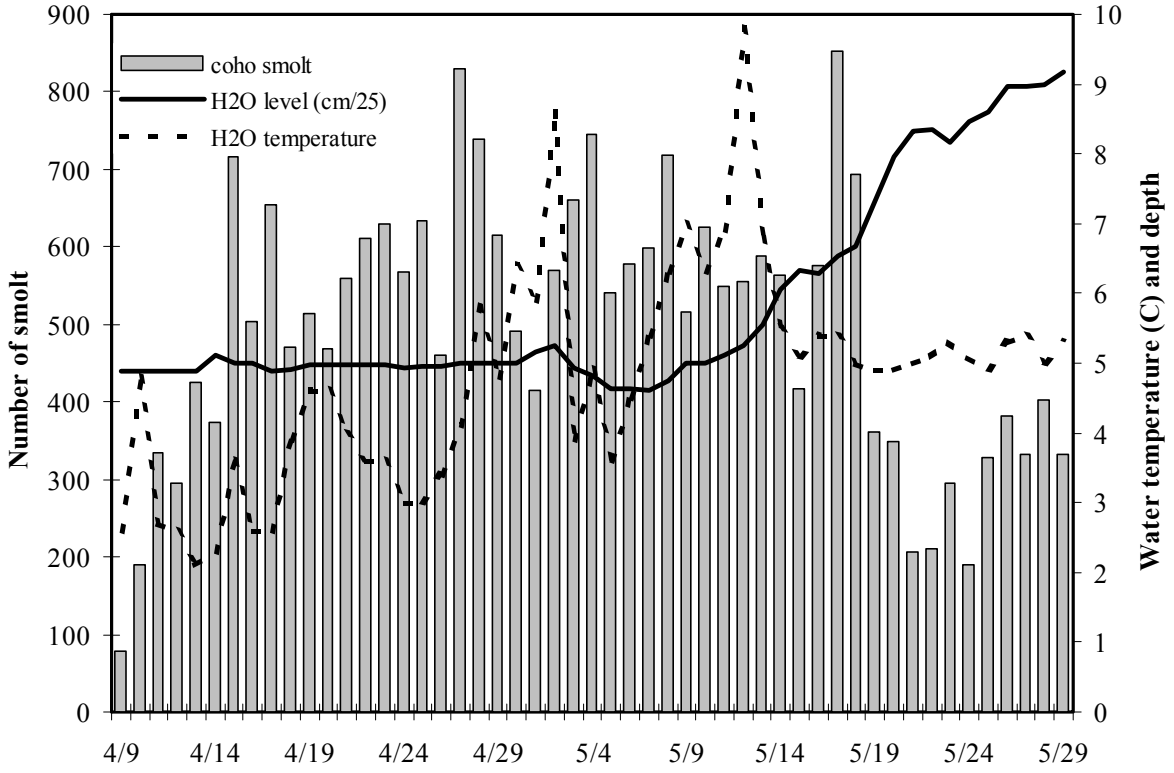


Figure 2.–Daily water depth (cm/25), temperature (°C), and catches of coho salmon smolt ≥ 75 mm in Chilkat River, April 9 through May 29, 2002.

with Markov Chain Monte Carlo techniques (Gilks et al. 1994). Non-informative priors were used for $\hat{q}_j$.

The proportion of the spawning population in each spawning area was estimated as above, except that we restricted equation 11 to those fish assigned a probable spawning fate in the Chilkat River drainage.

RESULTS

2002 SMOLT TAGGING, AGE AND SIZE

We marked 25,316 coho salmon smolt ≥75 mm FL during the spring of 2002 with an adipose fin clip and a CWT (Table 2). Twenty (20) of these died within 24h of tagging, leaving a total marked population of 25,296 (Table 3). An estimated 7 coho smolt shed their tags within 24h. In addition, we tagged 4,720 Chinook salmon ≥50 mm, 6 of which died within 24h (Tables 2 and 3).

The catch of coho salmon peaked on May 17 (Figure 2). The average weekly catch of coho smolt per minnow trap (CPUE) peaked between April 21 and April 27, and again between May 22 and May 26 (Table 2).

Three hundred thirty-six (336) coho salmon smolt ≥75 mm were sampled from the Chilkat River for age (scales), weight and length during spring 2002 (Table 4). Those sampled averaged 86 mm FL (SE = 0.5 mm) and 6.5 g (SE = 0.1 g) in weight. Age-1 dominated the emigration (81.3%, SE = 2.2%) of smolt from the Chilkat River (Table 4).

NSRAA personnel captured 7,156 coho salmon smolt emigrating out of Chilkat Lake between May 19, and June 23, 2002. A total of 480 were

Table 2.–Number of traps checked and smolt caught and tagged in the Chilkat River by time period, April 9 through May 29, 2002 and captured at Chilkat Lake outlet, May 19 through June 23, 2002.

	Chilkat River					Chilkat Lake[b]
	Traps	Number tagged		CPUE[a]		
Dates	checked	Coho	Chinook	Coho	Chinook	Coho catch
04/09-04/13	356	1,325	365	3.7	1.0	
04/14-04/20	613	3,702	1,490	6.0	2.4	
04/21-04/27	591	4,292	964	7.3	1.6	
04/28-05/04	634	4,237	692	6.7	1.1	
05/05-05/11	593	4,129	800	7.0	1.3	
05/12-05/18	585	4,245	387	7.3	0.7	
05/19-05/25	412	1,940	10	4.7	0.0	1,704
05/26-06/01	294	1,447	12	4.9	0.0	3,003
06/02-06/08						1,585
06/09-06/15						692
06/16-06/22						166
06/23						6
Total	4,078	25,316	4,720	6.2	1.2	4,707

[a] Catch of smolt per trap day.

[b] Northern Southeast Regional Aquaculture Association (NSRAA) personnel operated a smolt trap on the outlet of Chilkat Lake to monitor the emigration of sockeye salmon smolt. They counted and sampled coho salmon smolt.

Table 3.–Summary of coded wire tagging data in the Chilkat River drainage during spring 2002.

Tag code	Species	Last date	Tagged	24h morts	Marked	Shed tags	Valid CWTs
04-05-52	coho	5/19/2002	21,884	13	21,871	0	21,871
04-03-71	coho	5/29/2002	3,432	7	3,425	7	3,418
Coho subtotal			25,316	20	25,296	7	25,289
04-05-40	Chinook	5/29/2002	4,720	6	4,714	5	4,709
Chinook subtotal			4,720	6	4,714	5	4,709

Table 4.–Estimated age and size composition of coho salmon smolt ≥75 mm FL marked in the Chilkat River and sampled at Chilkat Lake, 2002.

		Age-1	Age-2	Total aged	Total sampled
Chilkat River	sample size	266	61	327	336
	percent (SE)	81.3 (2.2)	18.7 (2.2)		
	mean length (SE)	83 (0.4)	96 (1.2)		86 (0.5)
	mean weight (SE)	6.0 (0.1)	8.8 (0.4)		6.5 (0.1)
Chilkat Lake[a]	sample size	204	196	400	480
	weighted percent (SE) [b]	47.9 (2.8)	52.1 (2.8)		
	mean length (SE)	98 (0.6)	114 (0.7)		107 (0.5)
	mean weight (SE)	8.7 (0.1)	13.7 (0.3)		11.4 (0.2)

[a] Coho smolt were sampled at the Chilkat Lake outlet by NSRAA.

[b] Chilkat Lake samples were weighted to correct for non-proportional sampling.

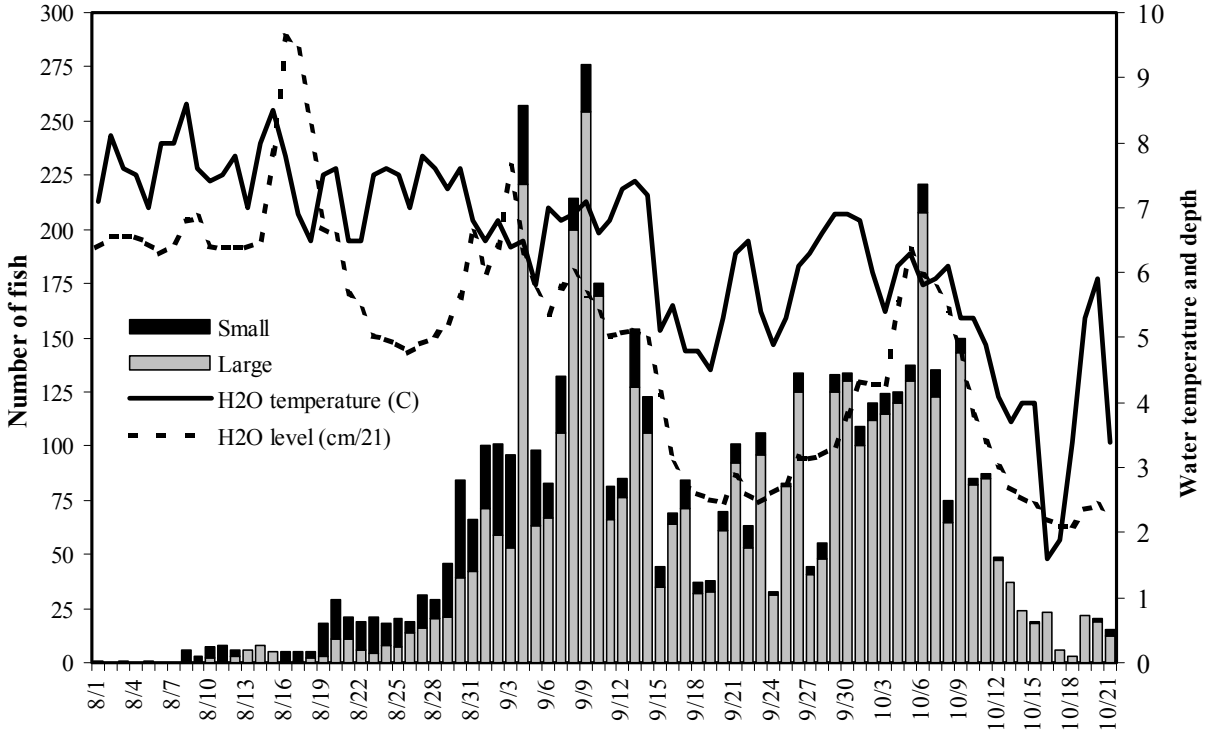


Figure 3.–Daily water depth (cm/21), temperature (°C), and fish wheel catch of adult coho salmon in the lower Chilkat River, by size, August 1 through October 21, 2003.

sampled for age, weight, and length (Table 4). These smolt were significantly older (52.1% age-2) than those sampled from the Chilkat River (χ^2 = 72.5, df = 1, P < 0.001). Those sampled at Chilkat Lake were also larger on average (107 mm, 11.4 g) than those sampled from the Chilkat River (86 mm, 6.5 g).

2003 LOWER RIVER ADULT SAMPLING

The 2003 coho salmon catch in the Chilkat River fish wheels was the highest on record. Between August 1 and October 21, 2003, we captured a total of 5,277 adult coho salmon in fish wheels (Figure 3). Of those caught, we examined 5,236 for missing adipose fins (Table 5). Seventy-eight (78) fish were missing an adipose fin and their heads were examined for CWTs. Seventy-seven contained decodable tags: one was tagged at Jordon Creek (near Juneau); one was tagged in 2001; and the rest (75) were tagged in 2002.

We obtained scale samples from 1,187 coho salmon; 1,062 were successfully aged; and 1,047 of these were aged 1.1 or 2.1 (ocean age-1; Table 6). Based on this information, we estimate that 5,162 adults sampled for missing adipose fins in 2003 emigrated as smolt during 2002.

SMOLT ABUNDANCE

Smolt abundance was estimated using a 2-event Peterson capture-recapture model with mortality, but not recruitment, between events. The first event consisted of the 25,296 smolt released during the spring of 2002. A total of 76 marked fish (75 with 2002 Chilkat River tag codes and one missing tag) were recovered out of the 5,162 ocean age-1 adults sampled from the fish wheels in 2003. Thus, the estimated marked fraction θ_s germane to smolt abundance was 0.0147 (SE = 0.0017); and the estimated number of coho salmon smolt emigrating from the Chilkat River in 2002 was 1,696,212 (SE = 190,330).

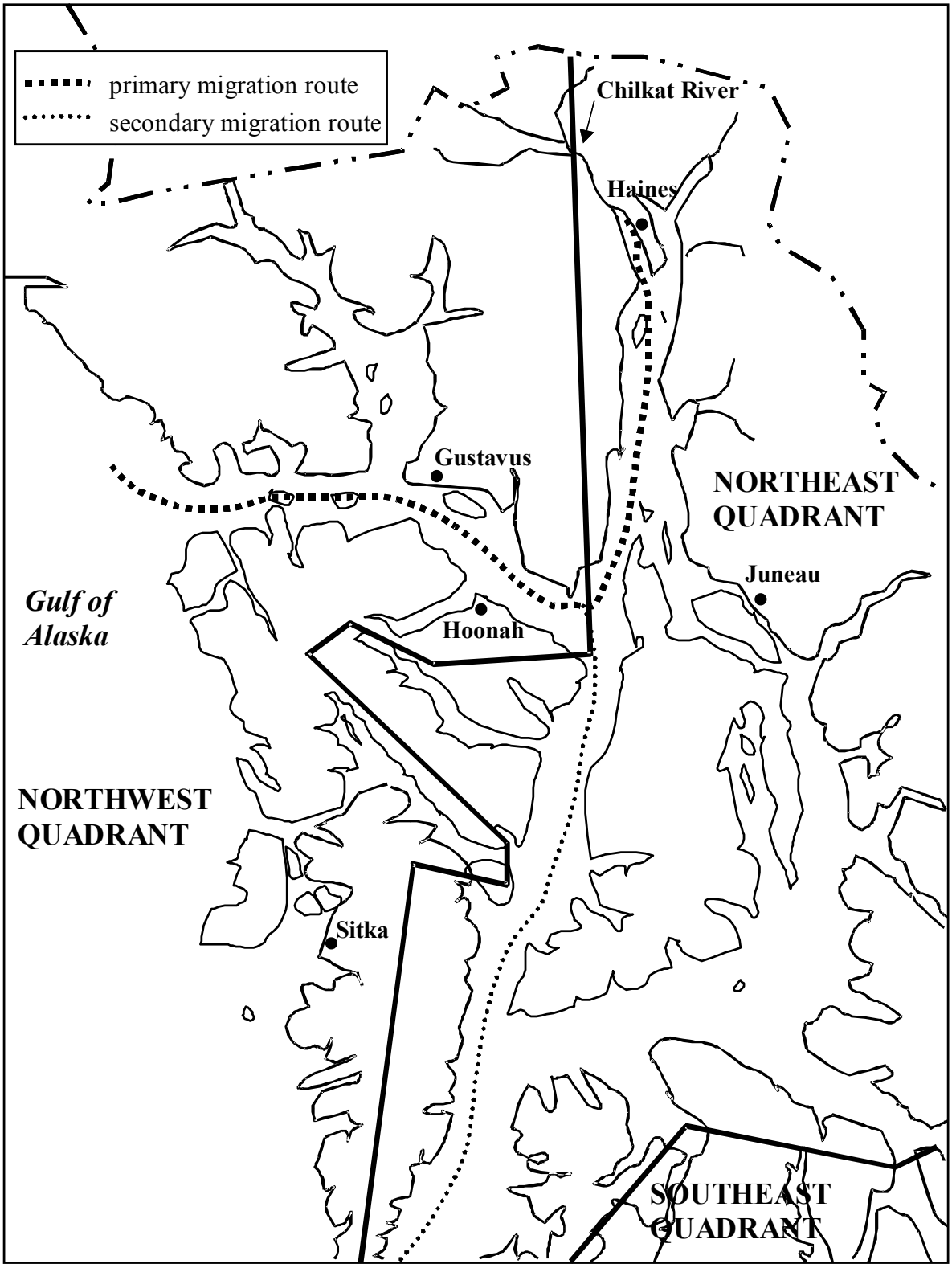


Figure 4.–Commercial troll quadrants and migration routes of Chilkat River coho salmon through northern Southeast Alaska.

Table 5.–Number of adult coho salmon sampled in the lower Chilkat River for missing adipose fins and coded wire tags, 2003.

Statistical week	Number sampled	Tag code				No tag	Total ad clips	Percent marked
		03-60-05[a]	04-02-98[b]	04-03-71	04-05-52			
31	1						0	0.0
32	11			1			1	9.1
33	45						0	0.0
34	116				2		2	1.7
35	247			2	1		3	1.2
36	800			2	6		8	1.0
37	1,110				7	1	8	0.7
38	459			2	4		6	1.3
39	558			1	10		11	2.0
40	800	1	1	4	13		19	2.4
41	871			4	15		19	2.2
42	161						0	0.0
43	57				1		1	1.8
Total	5,236	1	1	16	59	1	78	1.5

[a] This tag code was used to tag coho smolt emigrating from Jordan Creek near Juneau in 2002.

[b] This tag code was used to tag smolt from the Chilkat River in 2001.

CODED WIRE TAG RECOVERY

In 2003, 426 CWTs with codes from Chilkat River drainage were recovered from coho salmon during the random sampling of various sport and commercial marine harvests (Table 7, Appendix A1). This included two with 2001 codes (04-02-98). Most tags (221) were recovered in the NW quadrant commercial troll fishery (Figure 4), followed by 187 recoveries in the commercial drift gillnet fishery (Table 7). Two (2) gillnet caught fish were recovered in a mixed district batch during statistical week 37 and were discarded from further analysis. CWTs were also recovered in the inside purse seine fisheries (5), and the Yakutat, Sitka, Elfin Cove, Gustavus, and Juneau marine sport fisheries (13).

Coho salmon bearing the different Chilkat River tag codes were recovered with similar relative frequencies in the District 115 (Lynn Canal) drift gillnet fishery from August 10 to October 4, and in the Northwest Quadrant troll fishery from July 20 to October 4 (Table 7). This indicates that tagged fish mixed well in the ocean environment. The percent of tags recovered in these two fisheries was 96% for all tag codes, with 44% recovered in gillnet and 52% in the troll fisheries.

There were 18 select recoveries (returned from a location with no sampling program) and 5 voluntary recoveries (returned from an area with a sampling program) of coho salmon bearing 2002 Chilkat River tag codes in 2003 (Appendix A1). Eight adult coho salmon were voluntarily turned in from the troll fishery, one from the Juneau marine sport fishery, and three from the Chilkat River sport fishery in 2003. Nine (9) were recovered during coho salmon recovery efforts in the Chilkat River drainage.

HARVEST

The tagged fraction θ_h germane to estimating harvest contributions was 0.0147 (SE = 0.0017). This estimate is based on the 76 fish with decoded Chilkat River tags in the 5,162 1-ocean adult coho salmon inspected for marks in 2003.

An estimated 83,150 (SE = 6,984) coho salmon bound for the Chilkat River were harvested in sampled marine commercial and sport fisheries in 2003 (Table 8). An additional 494 coho salmon were harvested in the Chilkat Inlet and Chilkat River subsistence fisheries, and 2,590 (SE = 500) in Haines area recreational fisheries for a total harvest of 86,234 (SE = 6,974, Table 9). Most of the harvest (60.0%; 51,794, SE = 6,369) occurred

Table 6.–Age, sex, and size of coho salmon sampled and radio tagged at the Chilkat River fish wheels, 2003.

		Brood year and age class				
		2000 2.0	2000 1.1	1999 2.1	**Total aged**	**Total sampled**
		FISH WHEEL SAMPLES				
Females	Sample size	0	367	65	432	476
	Percent		85.0	15.0		40.8
	Mean length		606	633		
	SD		64	58		
Males	Sample size	15	537	63	615	692
	Percent	2.4	87.3	10.3		59.2
	Mean length	324	569	603		
	SD	22	99	97		
All fish	Sample size	15	916	131	1,062	1,187
	Percent	1.4	86.3	12.3		
	Mean length	324	584	619		
	SD	22	88	81		
		RADIO TAGGED FISH				
Females	Sample size	0	46	4	50	54
	Percent		92.0	8.0		43.9
	Mean length		634	650		
	SD		37	7		
Males	Sample size	0	58	5	63	69
	Percent		92.1	7.9		56.1
	Mean length		610	656		
	SD		75	25		
All fish	Sample size	0	104	9	113	123
	Percent		92.0	8.0		
	Mean length		620	653		
	SD		62	19		

in the commercial troll fisheries followed by the Lynn Canal drift gillnet fishery (30.5%; 26,305, SE = 2,510). The remainder of the harvest occurred in the recreational (7.4%), commercial seine (1.5%), and subsistence (0.6%) fisheries. Harvests in the troll fisheries occurred earlier and over a longer period than in the other fisheries. Harvests in the troll fisheries occurred from mid July through the first week of October (Figure 5). In contrast, the harvest in the drift gillnet fishery occurred from mid August through the first week of October, and in the Juneau sport fisheries from early August to early September. The estimated mean date of harvest in the Northwest quadrant troll fishery was September 7 compared to September 11 for the Lynn Canal gillnet fishery.

INRIVER ABUNDANCE

Of the 5,277 fish captured in the lower river, 4,460 were marked and released (Table 10). Fifty (50) coho salmon escaped prior to being marked, 16 were found dead, and 77 were missing their adipose fin and were sacrificed to obtain the CWT (one marked fish was later recaptured on the spawning grounds with a missing adipose fin). In addition, 551 were intentionally released without marks (primarily September 15 and 28) when large fish wheel catches of both chum and coho salmon resulted in overcrowding in the holding boxes. In addition, 123 fish were given radio transmitters (Table 10) and were removed from the mark-recapture experiment.

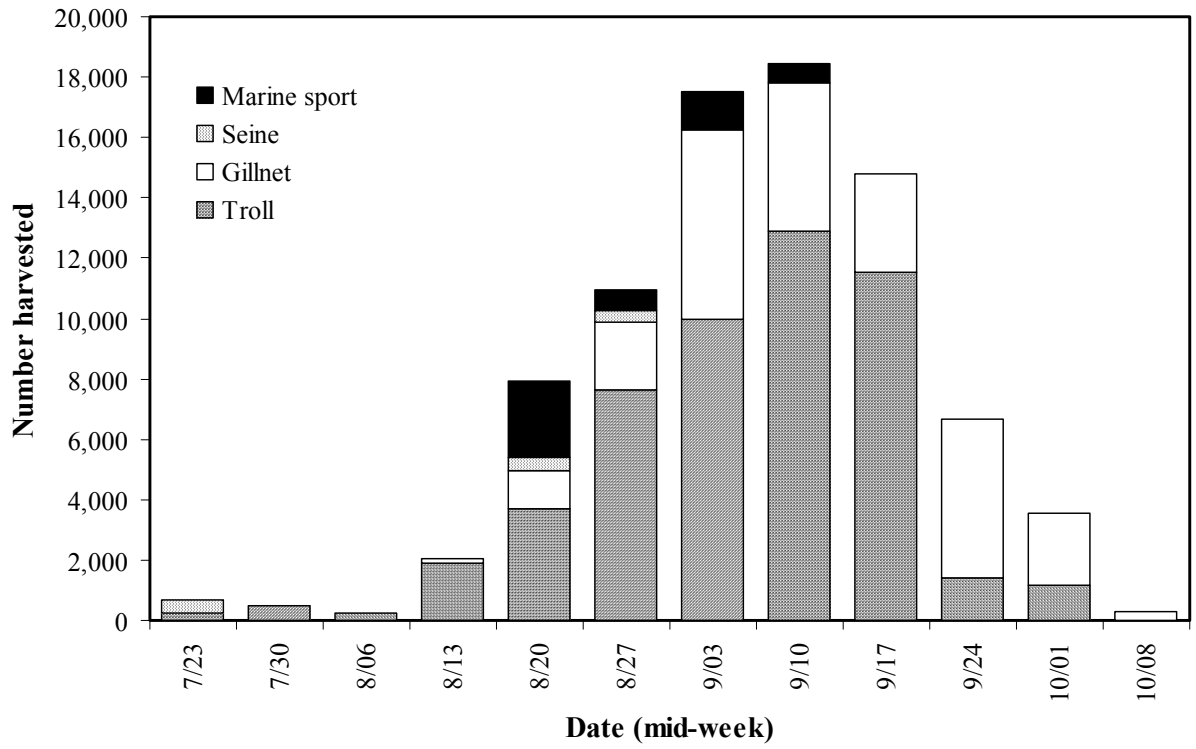


Figure 5.–Estimated marine harvests of coho salmon bound for the Chilkat River, by fishery and statistical week, 2003. Weekly estimates of harvest in the troll (period) and marine sport fisheries (biweek) are approximated.

We examined 4,934 coho salmon on the spawning grounds for marks (Table 11) and recovered 189 marked fish. Of these, 183 had tags and were recaptured 20 to 151 days (mean = 43 days, SD = 15 days) after being marked in the lower river, 3 were incomplete carcasses that were missing the dorsal region (where the tag would have been), and 3 had lost their tags.

The empirical cumulative distribution function (CDF) of lengths of coho salmon marked in the lower Chilkat River was significantly different from the CDF of marked coho salmon recaptured and measured on the spawning grounds (K-S test, $d_{max} = 0.140$, $P = 0.002$, Figure 6, top). In addition, coho salmon marked in the lower Chilkat River were significantly smaller than those sampled on the spawning grounds (K-S test, $d_{max} = 0.151$, $P < 0.001$, Figure 6, bottom). These results suggest the second sampling event was size-selective but the status of the first event was unknown. However, lengths of recaptured fish were 12 mm greater on average (SE = 2 mm) when measured on the spawning grounds than measured at marking. The CDF of lengths of coho salmon marked in the lower Chilkat River was not significantly different from the CDF of recaptured fish as measured during the marking event (K-S test, $d_{max} = 0.061$, $P = 0.563$, Figure 7, top). This suggests that there was either fish growth between sampling events, or that there was measurement bias during at least one event. When recapture lengths were adjusted to compensate for this difference (-10 mm and –15 mm), coho salmon marked in the lower Chilkat River were still significantly smaller than those sampled on the spawning grounds (K-S test, $d_{max} = 0.058$, $P < 0.001$, Figure 7, bottom). These results suggest the first sampling event was size-selective but the second event was not. To ensure that estimates were comparable between years and to minimize any potential biases, the estimate was stratified into two size classes: small fish (less than 500 mm MEF); and large fish (500 mm and larger). Length measurements taken during the recovery event were reduced by 10 mm to account for differences between the two events for the purposes of stratifying the recovery event.

Table 7.–Random marine recoveries of CWTs from Chilkat River coho salmon by tag code, fishery, and statistical week, 2003.

Statistical week	Dates	Tag code			Total
		04-02-98[a]	04-03-71	04-05-52	
District 115 Gillnet Fishery					
33	08/10-08/16	0	1	0	1
34	08/17-08/23	0	1	6	7
35	08/24-08/30	0	5	18	23
36	08/31-09/06	0	10	42	52
37	09/07-09/13	0	2	10	12
38	09/14-09/20	0	2	13	15
39	09/21-09/27	0	7	37	44
40	09/28-10/04	0	6	25	31
Mixed District Gillnet Fishery					
37	09/07-09/13	0	0	2	2
	Gillnet subtotal	0	34	153	187
35	08/24-08/30	0	0	1	1
37	09/07-09/13	0	1	3	4
38	09/14-09/20	0	0	3	3
Northwest Quadrant Troll					
30	07/20-07/26	0	1	0	1
31	07/27-08/02	0	0	2	2
32	08/03-08/09	0	0	1	1
33	08/10-08/16	0	3	5	8
34	08/17-08/23	1	5	10	16
35	08/24-08/30	0	7	25	32
36	08/31-09/06	0	2	41	43
37	09/07-09/13	0	10	42	52
38	09/14-09/20	1	7	39	47
39	09/21-09/27	0	0	6	6
40	09/28-10/04	0	0	5	5
	Troll subtotal	2	36	183	221
District 112 Purse Seine Fishery					
30	07/20-07/26	0	0	1	1
34	08/17-08/23	0	1	2	3
35	08/24-08/30	0	1	0	1
	Purse seine subtotal	0	2	3	5
Yakutat Marine Sport Fishery					
35	08/24-08/30	0	0	1	1
36	08/31-09/06	0	0	1	1
Sitka Marine Sport Fishery					
34	08/17-08/23	0	0	1	1
Elfin Cove Marine Sport Fishery					
34	08/17-08/23	0	0	1	1
Gustavus Marine Sport Fishery					
34	08/17-08/23	0	0	2	2
36	08/31-09/06	0	1	0	1
37	09/07-09/13	0	0	1	1
Juneau Marine Sport Fishery					
34	08/24-08/30	0	1	3	4
35	08/31-09/06	0	0	1	1
	Marine sport subtotal	0	2	11	13
Total recoveries		2	74	350	426
Valid tags released		5,283	3,418	21,871	
Percent gillnet		0.0	45.9	43.7	43.9
Percent troll		100.0	48.6	52.3	51.9
Percent gillnet & troll		100.0	94.6	96.0	95.8

[a] This tag code was used to tag coho smolt in 2001.

Table 8.–Estimated marine harvest in 2003 of adult coho salmon bound for the Chilkat River, by fishery and temporal stratum (= statistical week, except biweek in the marine recreational fisheries).

Fishery	District	Stat. week	Harvest	Var[*H*]	*n*	*a*	*a′*	*t*	*t′*	*m*	*r*	SE[*r*]
Lynn Canal gillnet	115	31-33	664	0	255	4	4	4	4	1	177	176
Lynn Canal gillnet	115	34	1,176	0	438	14	14	14	14	7	1,277	499
Lynn Canal gillnet	115	35	2,901	0	1,983	54	54	51	51	23	2,285	537
Lynn Canal gillnet	115	36	8,907	0	5,031	197	196	182	181	52	6,320	1,124
Lynn Canal gillnet	115	37	14,046	0	2,357	136	135	132	131	12	4,930	1,518
Lynn Canal gillnet	115	38	12,992	0	4,076	275	273	269	269	15	3,271	915
Lynn Canal gillnet	115	39	13,236	0	7,425	453	452	433	433	44	5,339	999
Lynn Canal gillnet	115	40-41	5,280	0	4,108	289	289	281	281	31	2,706	569
Lynn Canal gillnet subtotal			59,202	0	25,673	1,422	1,417	1,366	1,364	185	26,305	2,510
NW troll period 3		27-33	259,598	0	73,397	1,389	1,377	1,142	1,142	12	2,908	895
NW troll period 4		34-40	440,235	0	128,461	3,480	3,452	2,961	2,959	201	47,197	6,275
NW troll subtotal			699,833	0	201,858	4,869	4,829	4,103	4,101	213	50,105	6,338
NE troll period 4		34-40	63,455	0	20,412	469	469	408	408	8	1,689	622
NE troll subtotal			63,455	0	20,412	469	469	408	408	8	1,689	622
Purse seine	112	30	3,610	0	545	8	8	8	8	1	450	449
Purse seine	112	34	14,406	0	6,753	146	146	132	132	3	435	253
Purse seine	112	35	5,683	0	1,006	53	53	48	48	1	384	383
Purse seine subtotal			23,699	0	8,304	207	207	188	188	5	1,268	643
Yakutat marine sport	181-183	16-18	6,862	956,954	3,894	27	27	21	21	2	239	171
Yakutat marine sport subtotal			6,862	956,954	3,894	27	27	21	21	2	239	171
Sitka marine sport	113	17	19,383	15,845,986	5,439	173	173	151	151	1	242	242
Sitka marine sport subtotal			19,383	15,845,986	5,439	173	173	151	151	1	242	242
Icy Strait marine sport	114	12-18	19,065	4,105,575	3,191	50	49	46	46	5	2,070	968
Icy Strait marine sport subtotal			19,065	4,105,575	3,191	50	49	46	46	5	2,070	968
Juneau marine sport	111,112	17	7,787	468,270	4,724	143	141	127	127	3	341	200
Juneau marine sport	111,112	18-19	4,942	2,191,184	813	57	54	49	48	2	890	660
Juneau marine sport subtotal			12,729	2,659,454	5,537	200	195	176	175	5	1,230	689
Total			904,228	23,567,969	274,308	7,417	7,366	6,459	6,454	424	83,150	6,984

Spawning ground sampling was not uniform over time, as recovery rates were greater for large fish marked early in the immigration (Table 12). Large fish marked during three marking periods (8/1–9/6, 9/7–20, and 9/21–10/21) were recaptured at significantly different rates ($\chi^2 = 77.1$, df = 2, P < 0.001). In addition, the probability of capturing a large marked coho salmon differed significantly among the three large spawning areas ($\chi^2 = 8.11$, df = 2, P = 0.017). Therefore, a Darroch estimator was used to estimate abundance.

Partial pooling of the strata was necessary because inadmissible estimates (at least one estimated probability of capture and stratum abundance <0)

Table 9.–Total coho salmon harvest and estimated Chilkat River coho salmon harvest in Alaska fisheries, by fishery and area, 2003.

		Coho salmon harvest			Percent of harvest	
Fishery	**Area**	Total	Chilkat	SE	Fishery	Chilkat
Drift gillnet	District 115	59,621	26,305	2,510	44.1	30.5
U.S. troll fishery	NW Quadrant	699,833	50,105	6,338	7.2	58.1
	NE Quadrant	131,894	1,689	622	1.3	2.0
	Subtotal	831,727	51,794	6,369	6.2	60.1
Seine fishery	District 112	34,996	1,268	643	3.6	1.5
	Subtotal	34,996	1,268	643	3.6	1.5
Recreational	Yakutat marine	8,494	239	171	2.8	0.3
	Sitka marine	73,759	242	242	0.3	0.3
	Icy Strait marine	19,611	2,070	968	10.6	2.4
	Juneau marine	18,682	1,230	689	6.6	1.4
	Haines marine	377	101	51	26.8	0.1
	Chilkat River	2,489	2,489	497	100.0	2.9
	Subtotal	123,412	6,372	1,323	5.2	7.4
Subsistence	Chilkat Inlet	51	51	0	100.0	0.1
	Chilkat River	443	443	0	100.0	0.5
	Subtotal	494	494	0	100.0	0.6
Total		918,356	86,234	6,974	9.4	100.0

Table 10.–Number of coho salmon captured in the lower Chilkat River, and marked[a] and radio tagged by temporal stratum and size class[b], August 1 through October 21, 2003.

			Number marked				Number radio tagged			
Marking stratum	**Fin clip**	**Number captured**	Small	Large	Total	Proportion	Small	Large	Total	Proportion
08/01-08/24	None	175	106	60	166	0.95	1	3	4	0.02
08/24-09/06	Right pectoral	1,048	334	527	861	0.82	4	16	20	0.02
09/07-09/20	Left pectoral	1,582	156	1,018	1,174	0.74	3	37	40	0.03
09/21-10/04	Right axillary app.	1,364	90	1,162	1,252	0.92	1	41	42	0.03
10/05-10/21	Left axillary app.	1,108	60	947	1,007	0.91	0	17	17	0.02
	Total	5,277	746	3,714	4,460	0.85	9	114	123	0.02

[a] Radio tagged fish were not considered "marked" for the purpose of the abundance estimate.

[b] Fish were classified by length (MEF): small, <500 mm; large, ≥500 mm.

Table 11.–Number of coho salmon inspected for marks and number of marked fish recaptured during mark recovery surveys in the Chilkat River by site, size class[a] and sex, September 2003 through January 2004.

			Number inspected							Number marked						
			Small			Large				Small			Large			
Site	Dates	No. days sampled	M	F	U	M	F	U	Total	M	F	U	M	F	U	Total
UPPER CHILKAT AREA																
Tahini R.	10/02-10/30	14	106	5	0	394	290	1	796	13	0	0	28	12	0	53
Assignation Cr.	10/14-10/31	6	77	21	15	345	438	10	906	6	1	0	12	14	1	34
Kelsall R.	10/13-11/12	8	31	2	2	210	144	0	389	2	0	1	7	8	0	18
Subtotal		28	214	28	17	949	872	11	2,091	21	1	1	47	34	1	105
TSIRKU/KLEHINI AREA																
37 Mile Cr.	10/06-11/21	10	166	16	0	441	347	0	970	8	1	0	10	15	0	34
Herman Cr.	10/20-11/03	3	16	1	0	53	34	0	104	0	0	0	2	0	0	2
Bear Cr.	11/06-11/06	1	4	1	0	21	58	0	84	0	0	0	2	1	0	3
Klehini R.	11/04-11/07	3	6	0	0	23	28	0	57	0	0	0	1	0	0	1
Spring Cr.	10/06-11/20	8	21	2	1	138	63	3	228	0	0	0	3	2	0	5
Little Salmon R.	10/07-11/12	6	17	0	0	210	140	0	367	1	0	0	5	4	0	10
Chilkat Lake	09/29-11/05	10	21	7	0	69	67	0	164	0	0	0	1	3	0	4
Clear Cr.	11/10-01/23	3	2	0	0	120	92	0	214	0	0	0	3	1	0	4
Subtotal		44	253	27	1	1,075	829	3	2,188	9	1	0	27	26	0	63
LOWER CHILKAT AREA																
Jacquot's Landing	10/24-11/30	9	24	7	0	360	254	0	645	0	1	0	14	5	0	20
Bear Flats	12/29-12/29	1	0	0	0	3	7	0	10	0	0	0	0	1	0	1
Subtotal		10	24	7	0	363	261	0	655	0	1	0	14	6	0	21
Total		82	491	62	18	2,387	1,962	14	4,934	30	3	1	88	66	1	189

[a] Fish were classified by length (MEF): small, <500 mm; large, ≥500 mm.

were obtained when we applied the Darroch model to the original 5 marking strata and 13 recovery strata. In addition, data from the radio-telemetry portion of the study were used to re-classify the recovery strata into stocks with "early", "middle", or "late" timing. The data were eventually pooled into two temporal marking periods and two recovery strata (spawning areas) (Table 13). An estimated 137,313 (SE = 15,078) coho salmon immigrated to the Chilkat River drainage in 2003 (Table 14). Of those, 19,860 (SE = 8,059) were small, and 117,453 (SE = 12,743) were large fish. The estimates are germane to the time of tagging in the lower river, because an unquantified removal occurs (due to predation and unreported inriver subsistence fishery harvests) between the two sampling events.

AGE AND SEX COMPOSITION OF THE INRIVER RUN

We sampled 253 small and 934 large coho salmon for age (scales) and sex in the lower Chilkat River during 2003. A total of 1,062 of these were successfully aged, representing three age classes (Table 15). In addition, 571 small and 4,349 large fish were sampled for sex determination during recovery surveys (Table 11).

Fish wheel samples were used to estimate age composition for each size class (Table 16). However, 28 tagged fish that were recaptured on the spawning grounds were sexed incorrectly (17%) during the marking event (see Discussion). In addition, sex ratios of fish sampled in the lower river and those sampled on the spawning grounds

Table 12.–Number of marked coho salmon released into the lower Chilkat River and recaptured by marking period and recovery site, and number examined for marks at each recovery site by size class, 2003.

			EARLY			MIDDLE							LATE		
Marking stratum	No. marked	Fraction recovered	Assignation Creek	Tahini River	37 mile Creek	Kelsall River	Bear Creek	Klehini River	Herman Creek	Spring Creek	Little Salmon River	Jacquot's Landing	Bear Flats	Chilkat weir	Clear Creek
SMALL FISH (<500 mm MEF)															
08/01-08/23	107	0.047	1	3	1	0	0	0	0	0	0	0	0	0	0
08/24-09/06	333	0.075	6	9	8	2	0	0	0	0	0	0	0	0	0
09/07-09/20	156	0.026	0	1	0	1	0	0	0	0	1	1	0	0	0
09/21-10/04	90	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
10/05-10/21	60	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
Examined for marks			113	111	182	35	5	6	17	24	17	31	0	28	2
Fraction marked			0.062	0.117	0.049	0.086	0.000	0.000	0.000	0.000	0.059	0.032	0.000	0.000	0.000
LARGE FISH (≥500 mm MEF)															
08/01-08/23	61	0.016	1	0	0	0	0	0	0	0	0	0	0	0	0
08/24-09/06	527	0.083	12	17	9	3	0	0	0	0	0	2	0	1	0
09/07-09/20	1,018	0.074	9	22	15	10	2	0	1	2	2	9	0	3	0
09/21-10/04	1,161	0.024	5	1	1	2	1	1	1	3	7	5	1	0	0
10/05-10/21	947	0.007	0	0	0	0	0	0	0	0	0	3	0	0	4
Examined for marks			793	685	788	354	79	51	87	204	350	614	10	136	212
Fraction marked			0.034	0.058	0.032	0.042	0.038	0.020	0.023	0.025	0.026	0.031	0.100	0.029	0.019

Table 13.–Pooled number of coho salmon marked by stratum, recovered by marking and recovery stratum, and examined for marks by recovery stratum and size class in the Chilkat River drainage, 2003.

Marking stratum	No. marked	Fraction recovered	Early	Middle/ late
		Small fish		
08/01-09/06	440	0.068	28	2
09/07-10/21	306	0.013	1	3
Examined for marks			406	165
Fraction marked			0.071	0.030
		Large fish		
08/01-09/06	588	0.077	39	6
09/07-10/21	3,126	0.035	53	57
Examined for marks			2,266	2,097
Fraction marked			0.041	0.030

were significantly different for large fish (χ^2 = 35.8, df = 1, P < 0.001). Therefore, only the spawning ground samples were used to estimate sex composition (by size and age) in the escapement (Table 16). The majority of the escapement (118,387, SE = 10,163) was age-1.1 fish and males (82,099, SE = 10,048).

MARINE EXPLOITATION AND SURVIVAL

Based on a total 2003 run of 219,291 (1-ocean-age, SE = 16,588) adult coho salmon bound for the Chilkat River, we estimate the marine survival rate at 12.9% (Table 17, SE = 1.7%). The marine exploitation of this stock was estimated at 38.0% (Table 17, SE = 3.3%).

RADIO TELEMETRY

Chilkat River fish wheels operated for 3,737 hours out of a possible 3,936 hours from August 1 to October 21, 2003 (Table 18). Of the 5,277 fish caught, 123 coho salmon were marked with radiotags (Table 18). These fish ranged in size from 450 to 710 mm MEF, with a mean length of 623 mm (SD = 59 mm). The age composition of radio tagged fish was not significantly different from other non-jack coho salmon sampled in the fish wheels (Table 6, χ^2 = 1.86, df = 1, P = 0.173).

All of the radio tagged coho salmon moved upstream after being released. However, one fish returned downstream past the MP 9 tracking station 7 days after upriver passage and was located on December 4 by aerial survey in the Davidson River, which flows into Chilkat Inlet at Glacier Point. The number of days for radio tagged coho salmon to resume upstream movement past the MP 9 tracking station after tagging ranged from 0.1 to 10.6 d (Appendix A2, A3). We could not detect any significant relationship between the date of tagging and the time taken to resume upriver movement. There was a loose but significant trend (r^2 = 0.13, p < 0.001) for fish headed to the furthest spawning areas to take less time to resume upriver movement than fish headed to closer spawning areas (Figure 8).

A total of 112 radio tagged coho salmon were eventually tracked to probable spawning locations in the Chilkat River drainage (Appendix A4). Four radio tagged coho salmon were returned from Chilkat River sport and subsistence fisheries (Appendix A2). Five radio tagged coho salmon moved upriver but did not reach probable spawning locations. One radio tagged coho salmon moved upstream of the MP 9 tracking station and was identified as alive and upstream by the MP 9 station for two days after tagging, but was never identified by aerial surveys, ground surveys, or by other tracking stations.

Table 14.–Estimated abundance of coho salmon in the Chilkat River by size class, 2003.

Size category	Abundance	SE
Small	19,860	8,059
Large	117,453	12,743
Combined	137,313	15,078

Table 15.– Ages of coho salmon captured in the Chilkat River fish wheels by size class, 2003.

		Brood year and age class				
		2000	2000	1999	**Total**	**Total**
		2.0	1.1	2.1	**aged**	**sampled**
Small	Sample size	15	195	15	225	253
	Percent	6.7	86.7	6.7		21.3
	SE	1.7	2.3	1.7		1.2
Large	Sample size	0	721	116	837	934
	Percent		86.1	13.9		78.7
	SE		1.2	1.2		1.2

Table 16.–Estimated abundance of coho salmon in the Chilkat River by age, sex, and size class, 2003.

	Brood year and age class			
	2000	2000	1999	
	2.0	1.1	2.1	Total
	Small fish			
Male	1,176	15,282	1,176	17,633
SE	548	6,216	548	7,160
Female	148	1,930	148	2,227
SE	71	812	71	936
All small	1,324	17,212	1,324	19,860
SE	552	6,269	552	8,059
	Large fish			
Male		55,531	8,934	64,465
SE		6,121	1,241	7,049
Female		45,644	7,344	52,988
SE		5,049	1,023	5,816
All large		101,175	16,278	117,453
SE		7,935	1,608	12,743
	Combined			
Male	1,176	70,813	10,110	82,099
SE	548	8,723	1,357	10,048
Female	148	47,574	7,492	55,214
SE	71	5,114	1,025	5,891
All fish	1,324	118,387	17,602	137,313
SE	552	10,112	1,700	15,078

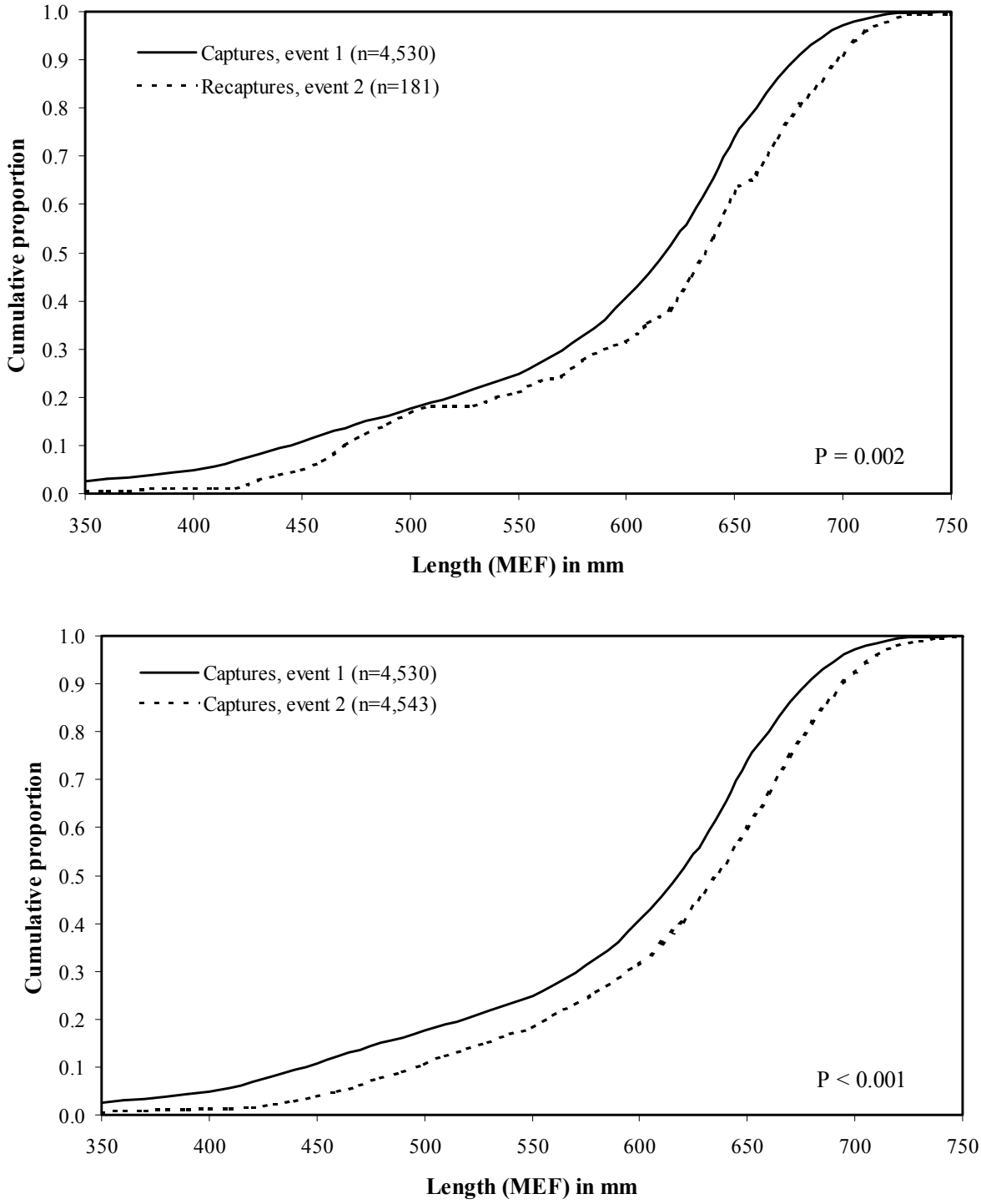
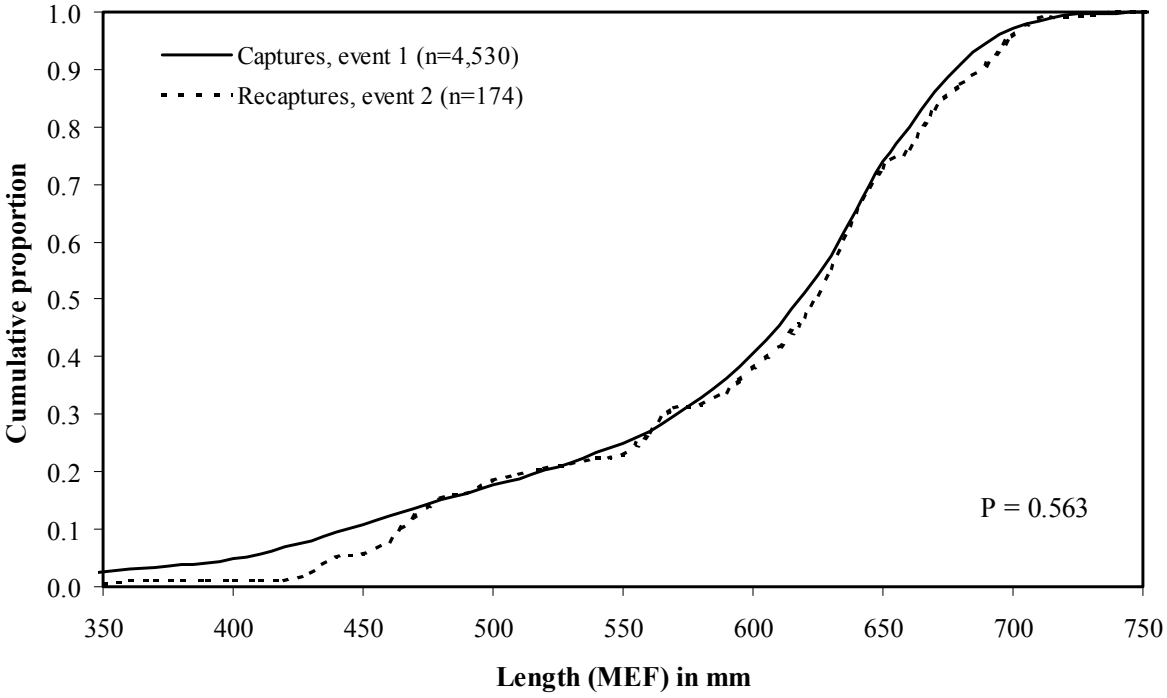


Figure 6.–Cumulative distribution function (CDF) of MEF lengths of coho salmon marked in the lower Chilkat River versus lengths of marked fish recaptured on the spawning grounds (top) and versus lengths of fish examined for marks on the spawning grounds (bottom), 2003.



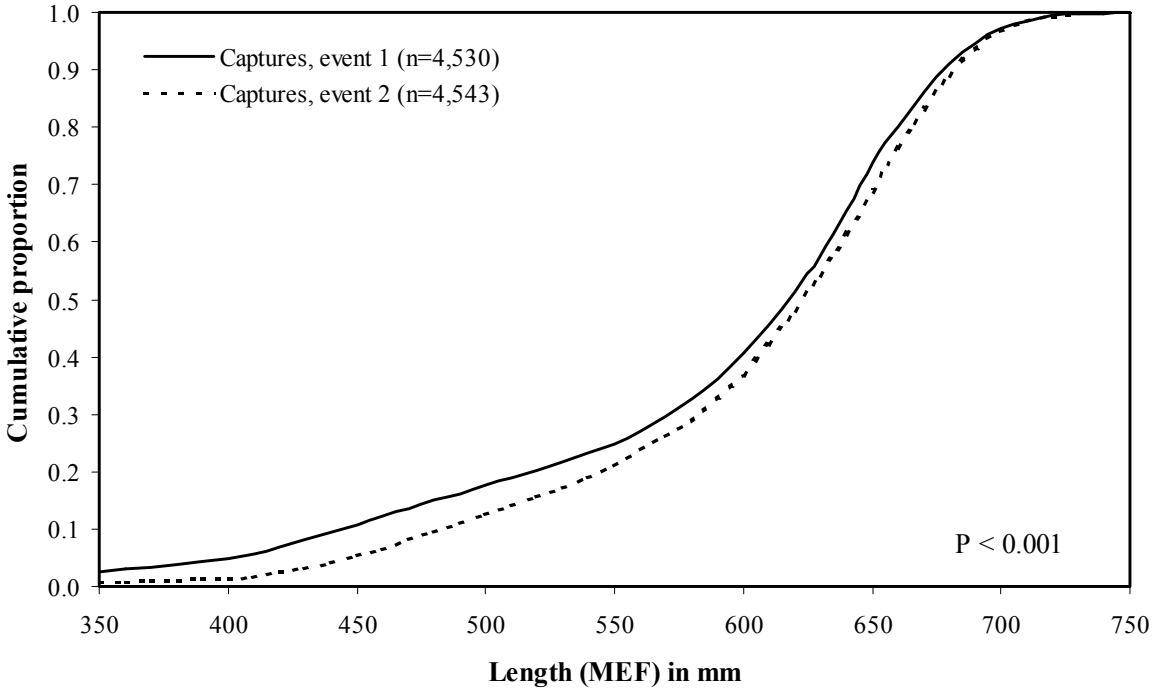


Figure 7.–Cumulative distribution function (CDF) of MEF lengths of coho salmon marked in the lower Chilkat River versus lengths (at marking) of fish recaptured on the spawning grounds (top) and versus adjusted lengths of fish examined for marks on the spawning grounds (bottom), 2003.

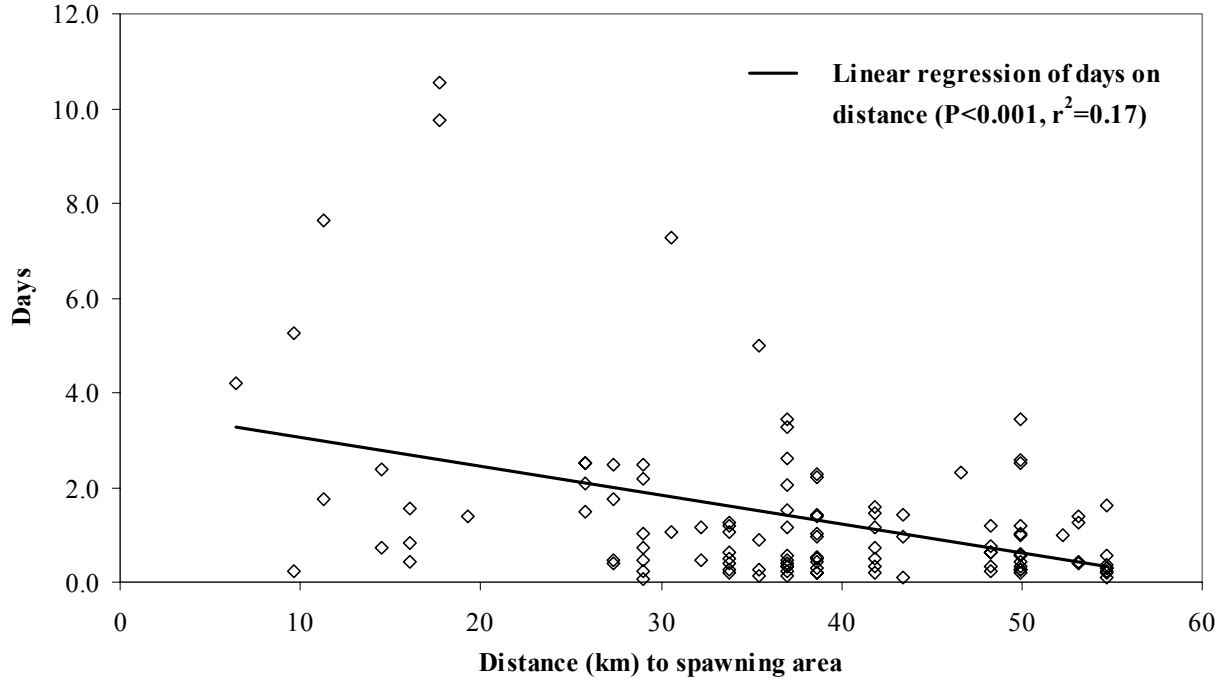


Figure 8.–Times to resume upriver movement after tagging versus distance traveled from tagging site to spawning area for 112 radio tagged coho salmon that reached Chilkat River drainage spawning areas, 2003.

Table 17.–Estimated stock assessment parameters for coho salmon that emigrated from the Chilkat River in 2002.

Parameter	Estimate	SE
2002 smolt emigration	1,696,212	190,330
2003 marine harvest	83,302	6,956
2003 1-ocean age inriver run[a]	135,989	15,067
Total 2003 run	219,291	16,596
Marine exploitation rate	38.0%	3.3%
Marine survival	12.9%	1.7%

[a] Total inriver run excluding age-2.0-fish.

After adjusting for non-proportional tagging (Table 18), we estimate that 91.5% (SE = 3.4%) of the fish that entered the Chilkat River spawned in the drainage, 3% were taken by inriver fisheries, 5% continued upriver movement, but did not reach a spawning area, and less than 1% backed out of the Chilkat River and spawned elsewhere (Table 19). Radio tagged fish were tracked to 19 separate spawning locations within the drainage (Table 20, Figure 9). Nine of these were considered major spawning areas (with more than 5% of Chilkat River drainage spawners): Assignation Creek (13%); Tahini River (10%); Little Salmon River (10%); Clear Creek adjacent to Chilkat Lake (10%); Chilkat River at Jacquot's Landing (9%); Chilkat River sites from RKM 22 to 33 (8%); Chilkat Lake tributaries (7%); Bear Flats (7%); and, Kelsall River (6%) (Table 20).

The median tagging dates of radio tagged coho salmon that reached Chilkat River drainage spawning areas ranged from September 5 for the Tahini River spawners to October 8 for the Clear Creek spawners (Figure 10).

DATA FILES

Data collected during this study (Appendix A5) have been archived in ADF&G offices in Haines, Douglas, and Anchorage.

DISCUSSION

Several assumptions, as noted above, underlie our estimates of abundance. We attempted to make sure that every smolt had an equal chance of being marked. Although smolt were still being captured when we ceased trapping on May 29, catch rates were declining (Table 2). Therefore, we believe

Table 18.–Chilkat River fish wheel coho salmon catch and radio tagging data used to adjust for non-proportional tagging, 2003.

Marking stratum	Number caught	Number radio tagged	Hours fished	Possible fishing hours	Adjusted catch
08/01-08/23	175	4	1,094	1,104	177
08/24-09/06	1,048	20	633	672	1,113
09/07-09/20	1,582	40	622	672	1,709
09/21-10/04	1,364	42	669	672	1,370
10/05-10/21	1,108	17	719	816	1,257
Total	5,277	123	3,737	3,936	5,626

Table 19. –Fates of radio tagged coho salmon, by number and by estimated proportions, Chilkat River, 2003. **Standard errors of proportions are in parentheses.**

Marking stratum	Unknown	Fishing mortality	Pre-spawning mortality or tag regurgitation	Backout	Chilkat drainage spawners		Total
					Tributary	Mainstem	
Number of radio tagged coho salmon							
08/01-08/23	0	0	0	0	4	0	4
08/24-09/06	0	2	1	0	14	3	20
09/07-09/20	0	0	1	0	33	6	40
09/21-10/04	1	2	2	1	26	10	42
10/05-10/21	0	0	1	0	13	3	17
Total number	**1**	**4**	**5**	**1**	**90**	**22**	**123**
Adjusted proportion of radio tagged coho salmon							
	0.006	**0.031**	**0.042**	**0.006**	**0.742**	**0.173**	**1.000**
	Did not spawn in Chilkat drainage						
	0.085 (0.027)				**0.742 (0.040)**	**0.173 (0.034)**	

that we sampled the bulk of the emigration. In addition, sampling effort for adults in the fish wheels (to estimate the marked fraction) was relatively constant over time, tending to equalize probability of capture during the second sampling event. Also, the estimated marked fraction varied very little between the first (prior to statistical week 37) and second half of the run (Table 5; χ^2 = 1.31, df = 1, P = 0.253). This suggests that marked and unmarked fish mixed completely between sampling events, thus acting to satisfy assumption a. While the population in this experiment was not closed to losses from mortality, it was closed to recruitment (assumption b) because salmon return to their natal stream to spawn. Because different capture gear was used during the first and second sampling events, it is unlikely that marking affected the catchability of adults (assumption c). Other studies have shown that marked coho smolt do not suffer significantly higher mortality than unmarked fish (Elliott and Sterritt 1990; Vincent-Lang 1993). Because all fish had secondary marks (adipose fin clips) that were not lost, assumption (d) was satisfied. Personnel sampling the fish wheels examined each fish for missing adipose fins. However, we did recapture a tagged fish on the spawning grounds missing an adipose fin. Although this fish should have been sacrificed at the fish wheels, we believe this was a rare instance and assumption (e) was robust.

The assumptions for a Petersen mark-recapture experiment are generalized for the Darroch estimate (Arnason et al. 1996, Seber 1982) of

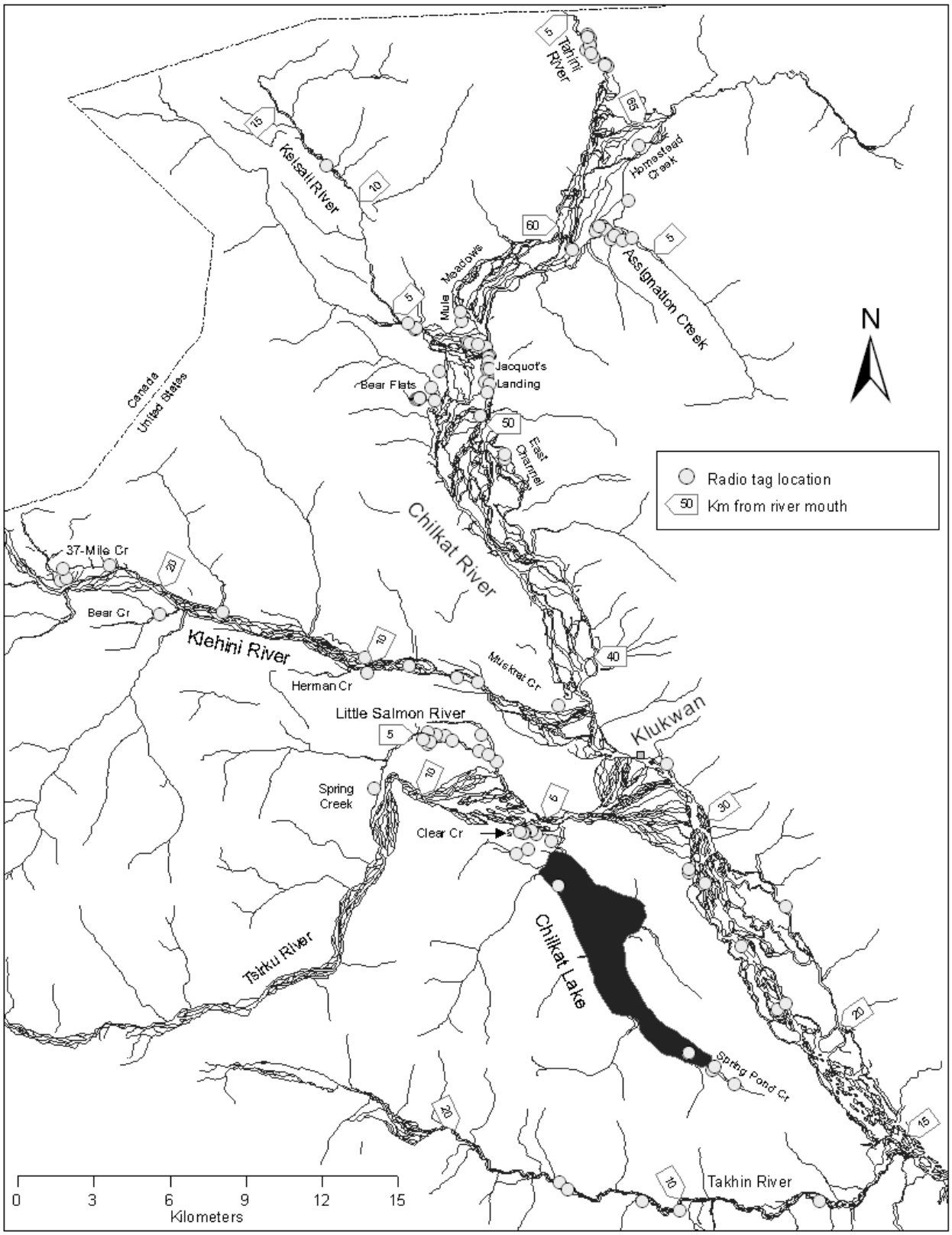


Figure 9.–Probable spawning locations of radio tagged coho salmon, Chilkat River drainage, 2003.

Table 20.–Spawning areas reached by radio tagged coho salmon, by number and estimated proportions, Chilkat River, 2003. Standard errors of proportions are in parentheses.

	Upper Chilkat River					Klehini River				Tsirku River				Lower Chilkat River						Chilkat drainage spawner total
Marking stratum	Tahini River	Home-stead Creek	Assig-nation Creek	Mule Mea-dows	Kelsall River	37-Mile Creek	Bear Creek	Herman Creek	Klehini RKM 5-16	Chilkat Lake	Clear Creek	Little Salmon	Spring Creek	Bear Flats	Chilkat East Channel	Chilkat Jacquot's Landing	Muskrat Creek	Chilkat RKM 22-33	Takhin River	
										Number of radio tagged coho salmon										
08/01-08/23	1	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4
08/24-09/06	5	0	5	0	0	0	0	0	0	0	1	2	0	0	2	1	1	0	0	17
09/07-09/20	4	0	6	0	5	2	0	2	3	2	0	5	1	2	0	6	0	0	1	39
09/21-10/04	1	1	2	1	3	1	1	0	0	2	0	4	0	6	0	5	0	5	4	36
10/05-10/21	0	0	0	1	0	0	0	0	1	3	6	1	0	1	0	0	0	3	0	16
Total	**11**	**1**	**15**	**2**	**8**	**4**	**1**	**2**	**4**	**7**	**7**	**12**	**1**	**9**	**2**	**12**	**1**	**8**	**5**	**112**
Prop.	**0.102**	**0.006**	**0.134**	**0.021**	**0.060**	**0.032**	**0.006**	**0.017**	**0.039**	**0.073**	**0.097**	**0.103**	**0.008**	**0.069**	**0.021**	**0.092**	**0.011**	**0.075**	**0.034**	**1.000**
Area total			**37**					**11**				**27**					**37**			
Area prop.			**0.323 (SE=0.039)**					**0.094 (SE=0.026)**				**0.281 (SE=0.039)**					**0.302 (SE=0.040)**			

adult salmon abundance: (a) every fish present during the marking event has a non-zero probability of recovery in one of the final strata and all fish in the final strata were also present in one of the initial strata [in salmon runs, closure is achieved by ensuring that sampling starts at the beginning of the run and that sampling continues until all animals have completed spawning]; (b) fish retain their marks and are correctly identified as marked or unmarked and, if marked, by initial stratum; (c) all fish in a given final stratum, whether marked or unmarked, have the same probability of being sampled; and (d) all marked and unmarked fish within a given marking stratum have the same probability of moving between strata. Fish wheels were operational in early June, long before the first coho salmon was captured on August 1, and continued through October 21. Less than 20 coho salmon per day were caught during the last days of fish wheel operations. In addition, less than 1% of the coho salmon were captured after October 21 in 1990 (when the wheels were operated through October 25). Thus, we believe that we tagged essentially throughout the entire immigration.

One radio tagged coho salmon backed out of the Chilkat River and spawned in another drainage. Because this corresponded to an estimated 0.6% of the fish that entered the river (Table 19), it does not represent a significant failure of assumption (a).

We continued recovery sampling until essentially all salmon had completed spawning. However, sampling effort was not consistent after November. The last recorded upstream movement of a radio tagged fish (fish 107) apparently moved into the Klehini River in early to mid January after the Klehini tower had been deactivated. This fish was last recorded at the Wells Bridge tower on January 9 (although it did not pass upstream of this site), 88 days after it passed upstream of the tower at MP 9. We did recover a tagged fish that had been marked on October 16 within five days of the end of marking and therefore assume that any bias due to this failure of assumption (a) was inconsequential.

A total of 6 of 189 marked fish (3%) were missing their tag (as determined from the secondary marks) during the recovery event. Three (3) of these 6 fish could be assigned to marking strata based on their secondary marks. As the remaining 3 fish represent a low percentage of the marked sample (2%), tag loss was a not a significant problem in this experiment and assumption (d) was essentially met.

Sex was estimated with uncertainty in the lower river (marking event). Twenty-eight (28) out of 159 tagged fish that were recaptured on the spawning grounds were sexed incorrectly during the marking event, as judged by sex determination on the spawning ground (where sexual dimorphism is more evident). Most (54%) of these were sexed as female when tagged and as males on the spawning grounds during 2003. Therefore using lower river samples to estimate sex composition would have overestimated the proportion of females in the escapement. We avoided this bias by using spawning ground samples to estimate sex composition by size category.

The timing of the coho salmon escapement into the Chilkat River was early and displayed a more bimodal pattern relative to years when the fish wheels were operated into October (1990 and 1997–2002). The mean date of migratory timing in 2003 was September 17. In contrast, the mean date for past years was September 20 (Figure 11).

The radio telemetry study assumes that the radio tagging process does not adversely affect the fish's ability to continue upstream migration. The necropsy of a 390 mm MEF male coho salmon that was retained after being given a radio transmitter showed that its stomach tissue was elastic and the radio transmitter did not fill the stomach to its capacity. Thus, with the care taken to gently seat the transmitter in the stomach just posterior of the esophagus, the likelihood of transmitters rupturing the stomach was low for coho salmon in the 450 mm to 710 mm MEF range used in this study.

The telemetry analysis also assumes that fish wheel efficiency is constant over the course of the season. The fraction of marked fish recovered declined during the last two tagging strata (Table 12) suggesting that the efficiency dropped during

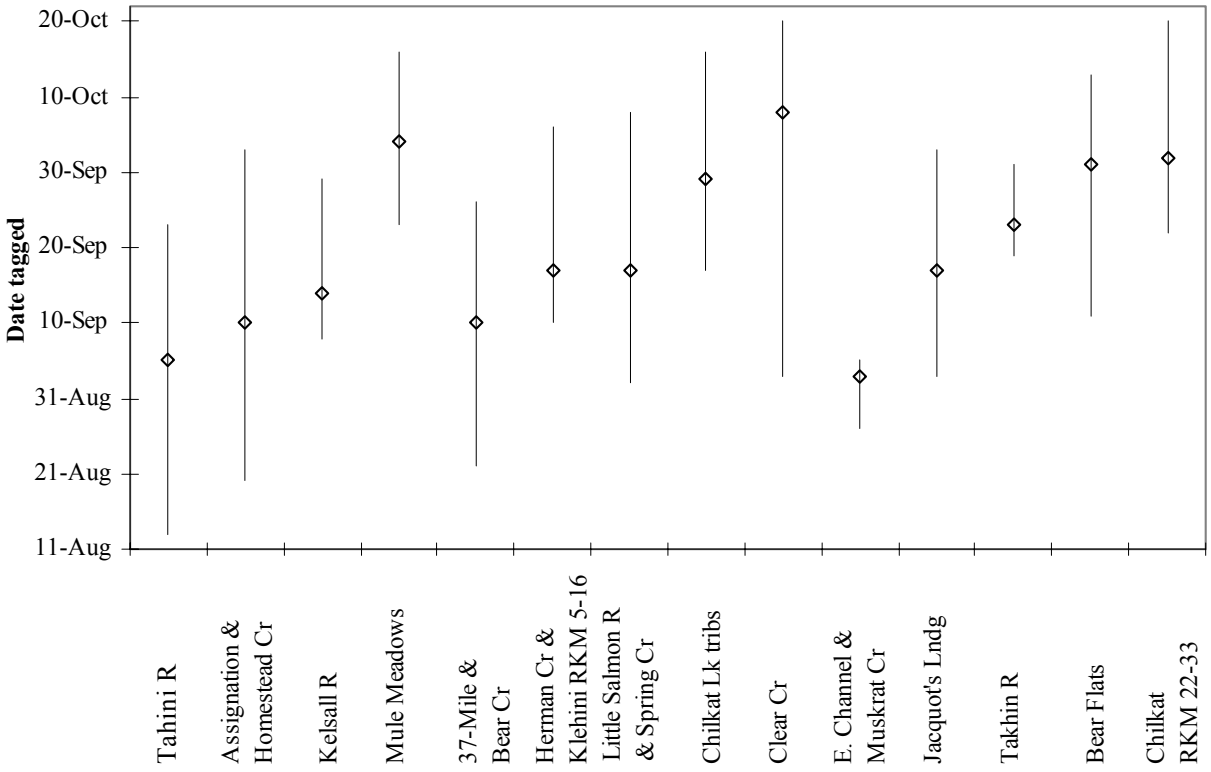


Figure 10.–Tagging date range (|) and median (◇) for 112 radio tagged coho salmon that reached Chilkat River drainage spawning areas, 2003.

the latter part of the season. However, river levels dropped during the latter part of the season (Figure 3). This should have increased gear efficiency rather than reducing it. Thus, we believe that the lower fraction of fish recovered because recovery sampling was not consistent after November (as described earlier) not because of a change in fish wheel efficiency.

The amount of time that radio-tagged salmon take to resume upriver migration was used in the Copper River Chinook salmon radio telemetry project as a test for adverse response to handling (Savereide 2003). In the 2003 Chilkat River study, the 28 fish that took the longest times (>1.6 d) to pass upstream of the MP 9 tracking station were all successful spawners (Appendix A2, A3). The trend for fish traveling to the furthest spawning areas to take the least amount of time to resume upriver movement may have confounded the utility of this time as a measure of fish response to tagging (Figure 8).

The 5% rate of radio tagged fish that had neither a spawning nor a fishery harvest fate (Table 19) was low compared to recent salmon radio telemetry studies that used similar methods (Stroka and Brase 2004, Savereide 2003, Chythlook and Evenson 2003). The less than 1% rate of radio tagged coho salmon backing out of the Chilkat River is very low compared to coho salmon radio telemetry studies in the Unuk (Weller et al. 2003) and Holitna Rivers (Stroka and Brase 2004).

The causes for the 6 non-spawning non-fishery radio-tagged coho salmon to not reach spawning grounds are ambiguous (Appendix A2). Fish number 26 was probably a case of tag regurgitation or premature mortality because the fish moved only 5 km upriver before showing a mortality signal, and the deep main Chilkat River channel location of the transmitter was not near a likely spawning area. The transmitter from fish number 13 was recovered October 2 in a recently dried silt-bottomed channel of the Chilkat River with its stainless steel wire antenna twisted and severed, indicating trauma by a predator or a scavenger. It is unlikely that this fish had spawned in that area because only fish headed to the furthest spawning areas, Tahini River and Assignation Creek, had reached their destinations

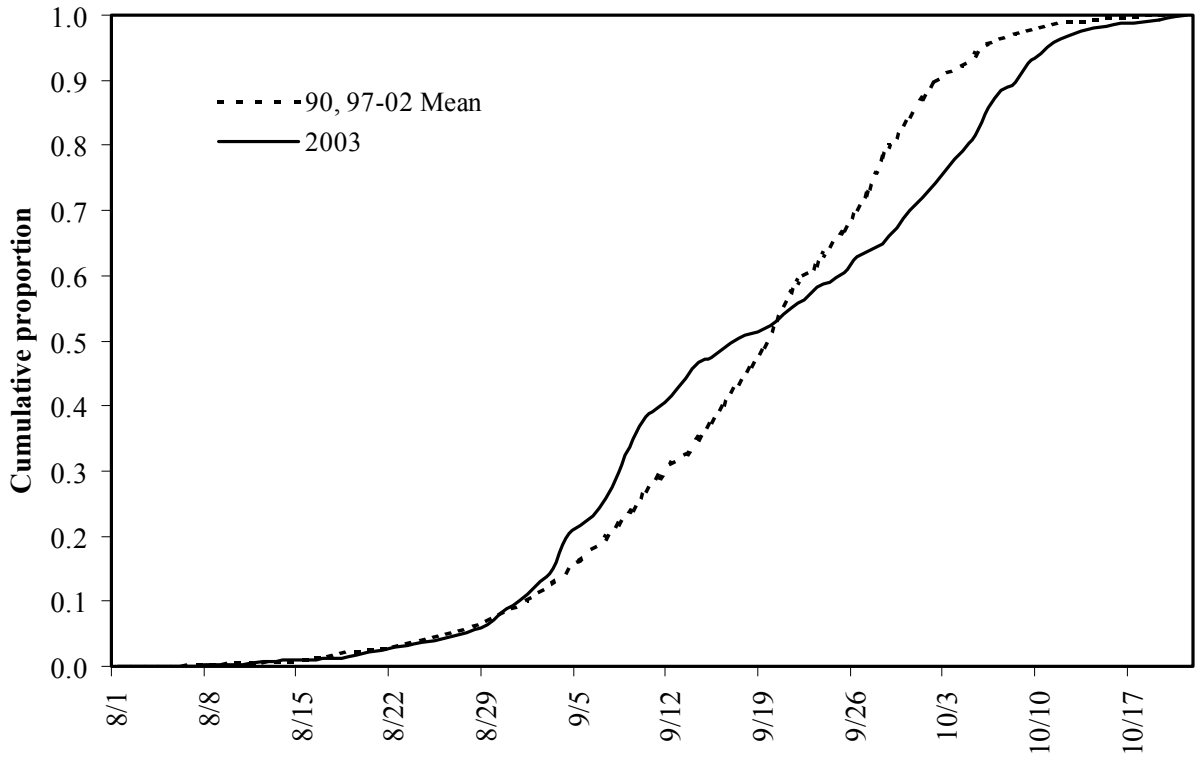


Figure 11.–Cumulative proportion of adult coho salmon captured in Chilkat River fish wheels during 2003 compared to the mean cumulative proportion of 1990, and 1997–2002.

by the September 18 aerial survey when fish number 13's mortality signal was first detected (Appendix A3). The transmitters from fish numbers 69, 70 and 110 were all located in a shallow channel of the Tsirku River within 500 m of the confluence with the Chilkat River at Klukwan. A ground survey November 6 revealed no signs of spawning in Tsirku River waters in the vicinity. Numerous eagles were perched in the surrounding Tsirku River delta and may have been preying on salmon attempting to migrate up the Tsirku River. Fish number 81 was probably a case of either transmitter failure or unreported and undetected fishery removal. The records from the MP 9 tracking station show a pattern of upstream passage and decreasing signal strength as the fish moved upriver out of range, as was typical of fish that successfully reached spawning areas. The MP 9, Wells Bridge, and Klehini tracking stations did not have any record of fish number 81's transmitter passing the stations by road, whereas the transmitters from the four fish reported as harvested in fisheries did produce such records after the fish were removed from the water.

The percent of Chilkat River coho salmon in the harvest varied greatly depending on the proximity of the fishery to the Chilkat River. Although we estimated that the NW troll fishery harvested the greatest number (50,105) of Chilkat River fish, they represented only 7.1% of this harvest (Table 9). The second largest harvest occurred in the Lynn Canal drift gillnet fishery (26,305) where Chilkat River fish represented 43.6% of the total harvest. As one might expect, Chilkat River fish contributed a greater percentage to the harvest in fisheries closer to the Chilkat River because the number of stocks present likely decreases with proximity.

One adult coho salmon with a 2002 Jordan Creek tag code was captured in the fish wheels operating in the Chilkat River (Appendix A1). This fish may have originated from the Chilkat

River and reared in Jordan Creek. One coho salmon smolt with a 2001 Chilkat River tag code was sampled as it emigrated from Jordan Creek near Juneau in 2002 (Ericksen 2003). This is not the first time smolt have been recovered from another drainage with Chilkat River codes. Two smolt were recaptured in the Berners River in 2000 with 1999 codes (Ericksen 2001). In addition, an adult coho salmon was recovered in a Chilkat River fish wheel in 1998 with a Berners River tag code (Ericksen 1999). This fish may have also migrated from the Chilkat River to the Berners River where it was captured and tagged. There is increasing evidence that smolt occasionally migrate through salt water to another freshwater drainage to rear for a period of time.

The estimates of the total harvest of Chilkat River coho salmon in 2003 should be considered minimum because not all fisheries were sampled and some were not sampled at rates sufficient to detect small harvests. For example, smaller marine sport fisheries (including those in Pelican and Icy Strait) were not sampled for coded wire tags. Thus, the contribution of various stocks to these fisheries cannot be estimated.

The exploitation of coho salmon in the Lynn Canal commercial drift gillnet fishery was lower than normal. The price paid for a gillnet-caught coho salmon averaged $0.36/lb over the season. This was slightly better than 2002, which had the lowest average price paid for coho salmon ($0.30/lb) in over 20 years. Many fishers stopped fishing earlier in the season rather than accept such a low price.

Our results indicate that coho salmon entering the river early in the season were headed toward the Upper Chilkat area. In addition, we found that later fish were headed for the Lower Chilkat area. This phenomenon is consistent with work done in 1990 (Dangel et al. Unpublished), 1998 (Ericksen 1999), and 2002 (Ericksen 2003). The radio telemetry study showed some exceptions to this rule. The three radio tagged fish that spawned in Muskrat Creek and in the East Channel of the upper Chilkat River had earlier

Table 21.–Peak number of coho salmon counted in spawning index tributaries of the Chilkat River, 1987–2003, mark-recapture estimates of all aged coho salmon for the entire drainage in 1990, 1998, 2002, and 2003, and the estimated expansion factor for peak surveys.

	Peak Surveys								
	Spring Creek	Kelsall River	Tahini River	Clear Creek	Combined	**M-R estimate**	**SE**	**Expansion factor**	**SE**
1987	99	197	792	25	1,113				
1988	87	160	590	40	877				
1989	57	190	1,064	141	1,452				
1990	88	379	2,766	150	3,383	79,807	9,980	23.59	2.95
1991	176	417	1,785	135	2,513				
1992	183	281	1,143	700	2,307				
1993	101	129	1,041	460	1,731				
1994	451	440	4,482	408	5,781				
1995	268	197	1,033	189	1,687				
1996	204	179	412	315	1,110				
1997	227	133	684	250	1,294				
1998	271	265	649	275	1,460	50,758	10,698	34.77	7.33
1999	335	207	962	195	1,699				
2000	305	571	1,324	435	2,635				
2001	450	225	1,272	1,285	3,232				
2002	1,328	440	2,582	1,310	5,660	205,429	31,165	36.29	5.51
2003	500	356	1,419	1,675	3,950	134,340	15,070	34.01	3.82
Average	302	280	1,412	470	2,464	117,584		32.17	5.79

migration timing than the radio tagged Kelsall River spawners, and Clear Creek spawners had earlier migration timing than Lower Chilkat River main stem spawners (Figure 10).

The 2003 immigration of 1-ocean-age fish 135,989 (SE = 15,067) is less than estimated in 2002 (208,720, SE = 31,172) but greater than estimated in 1990 (80,700, SE = 9,984) and 1998 (44,192, SE = 10,702). These results are consistent with peak counts of coho salmon on the index spawning tributaries for those years (Table 21). The expansion factor of fish counted during these four years was extremely consistent (mean 32.17 SE = 5.79, range = 23.59 to 36.29). This suggests that our counts are a valuable tool for indexing escapement.

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APPENDIX A

Appendix A1.–Random, select, and voluntary recoveries of coded wire tagged coho salmon returning to the Chilkat River in 2003.

Head number	Tag code	Gear	Port	Recovery date	Stat. week	Quad-rant	Dist.	Sub-dist.	Length
			RANDOM RECOVERIES						
519090	40371	Gillnet	Excursion Inlet	8/14/2003	33	NE	115		690
519157	40371	Gillnet	Excursion Inlet	8/21/2003	34	NE	115		510
519155	40552	Gillnet	Excursion Inlet	8/21/2003	34	NE	115		488
519154	40552	Gillnet	Excursion Inlet	8/21/2003	34	NE	115		527
519153	40552	Gillnet	Excursion Inlet	8/21/2003	34	NE	115		591
519152	40552	Gillnet	Excursion Inlet	8/21/2003	34	NE	115		760
519151	40552	Gillnet	Excursion Inlet	8/21/2003	34	NE	115		777
232152	40552	Gillnet	Juneau	8/21/2003	34	NE	115		504
519159	40552	Gillnet	Excursion Inlet	8/27/2003	35	NE	115		535
519160	40552	Gillnet	Excursion Inlet	8/27/2003	35	NE	115		545
519161	40552	Gillnet	Excursion Inlet	8/27/2003	35	NE	115		560
519163	40552	Gillnet	Excursion Inlet	8/27/2003	35	NE	115		573
519166	40552	Gillnet	Excursion Inlet	8/27/2003	35	NE	115		594
519164	40552	Gillnet	Excursion Inlet	8/27/2003	35	NE	115		692
519158	40552	Gillnet	Excursion Inlet	8/27/2003	35	NE	115		734
519169	40552	Gillnet	Excursion Inlet	8/27/2003	35	NE	115		781
520002	40371	Gillnet	Juneau	8/27/2003	35	NE	115		539
520004	40371	Gillnet	Juneau	8/27/2003	35	NE	115		561
520003	40371	Gillnet	Juneau	8/27/2003	35	NE	115		681
520005	40552	Gillnet	Juneau	8/27/2003	35	NE	115		645
520001	40552	Gillnet	Juneau	8/27/2003	35	NE	115		670
519191	40552	Gillnet	Excursion Inlet	8/28/2003	35	NE	115		748
519225	40371	Gillnet	Excursion Inlet	8/29/2003	35	NE	115		553
519224	40371	Gillnet	Excursion Inlet	8/29/2003	35	NE	115		630
519222	40552	Gillnet	Excursion Inlet	8/29/2003	35	NE	115		537
519215	40552	Gillnet	Excursion Inlet	8/29/2003	35	NE	115		554
519220	40552	Gillnet	Excursion Inlet	8/29/2003	35	NE	115		561
519216	40552	Gillnet	Excursion Inlet	8/29/2003	35	NE	115		565
519221	40552	Gillnet	Excursion Inlet	8/29/2003	35	NE	115		692
519218	40552	Gillnet	Excursion Inlet	8/29/2003	35	NE	115		745
519217	40552	Gillnet	Excursion Inlet	8/29/2003	35	NE	115		779
232165	40371	Gillnet	Juneau	9/2/2003	36	NE	115		584
232177	40371	Gillnet	Juneau	9/2/2003	36	NE	115		589
232168	40371	Gillnet	Juneau	9/2/2003	36	NE	115		774
232184	40552	Gillnet	Juneau	9/2/2003	36	NE	115		504
232185	40552	Gillnet	Juneau	9/2/2003	36	NE	115		528
232179	40552	Gillnet	Juneau	9/2/2003	36	NE	115		549
232183	40552	Gillnet	Juneau	9/2/2003	36	NE	115		590
232163	40552	Gillnet	Juneau	9/2/2003	36	NE	115		610
232182	40552	Gillnet	Juneau	9/2/2003	36	NE	115		673
232176	40552	Gillnet	Juneau	9/2/2003	36	NE	115		681
232173	40552	Gillnet	Juneau	9/2/2003	36	NE	115		684
232172	40552	Gillnet	Juneau	9/2/2003	36	NE	115		692
232186	40552	Gillnet	Juneau	9/2/2003	36	NE	115		700
232171	40552	Gillnet	Juneau	9/2/2003	36	NE	115		709
232175	40552	Gillnet	Juneau	9/2/2003	36	NE	115		709

-continued-

Appendix A1.–Page 2 of 11.

Head number	Tag code	Gear	Port	Recovery date	Stat. week	Quad-rant	Dist.	Sub-dist.	Length
232174	40552	Gillnet	Juneau	9/2/2003	36	NE	115		724
232178	40552	Gillnet	Juneau	9/2/2003	36	NE	115		742
232180	40552	Gillnet	Juneau	9/2/2003	36	NE	115		752
520110	40552	Gillnet	Juneau	9/4/2003	36	NE	115		581
520050	40552	Gillnet	Juneau	9/4/2003	36	NE	115		641
520122	40552	Gillnet	Juneau	9/4/2003	36	NE	115		667
520063	40371	Gillnet	Juneau	9/5/2003	36	NE	115		549
520157	40371	Gillnet	Juneau	9/5/2003	36	NE	115		581
520052	40371	Gillnet	Juneau	9/5/2003	36	NE	115		602
520078	40371	Gillnet	Juneau	9/5/2003	36	NE	115		667
520135	40371	Gillnet	Juneau	9/5/2003	36	NE	115		680
520123	40371	Gillnet	Juneau	9/5/2003	36	NE	115		691
520172	40371	Gillnet	Juneau	9/5/2003	36	NE	115		721
520077	40552	Gillnet	Juneau	9/5/2003	36	NE	115		560
520174	40552	Gillnet	Juneau	9/5/2003	36	NE	115		563
520175	40552	Gillnet	Juneau	9/5/2003	36	NE	115		567
520154	40552	Gillnet	Juneau	9/5/2003	36	NE	115		572
520068	40552	Gillnet	Juneau	9/5/2003	36	NE	115		580
520057	40552	Gillnet	Juneau	9/5/2003	36	NE	115		596
520134	40552	Gillnet	Juneau	9/5/2003	36	NE	115		631
520097	40552	Gillnet	Juneau	9/5/2003	36	NE	115		644
520089	40552	Gillnet	Juneau	9/5/2003	36	NE	115		649
520071	40552	Gillnet	Juneau	9/5/2003	36	NE	115		651
520137	40552	Gillnet	Juneau	9/5/2003	36	NE	115		652
520128	40552	Gillnet	Juneau	9/5/2003	36	NE	115		672
520160	40552	Gillnet	Juneau	9/5/2003	36	NE	115		674
520127	40552	Gillnet	Juneau	9/5/2003	36	NE	115		682
520079	40552	Gillnet	Juneau	9/5/2003	36	NE	115		684
520132	40552	Gillnet	Juneau	9/5/2003	36	NE	115		706
520159	40552	Gillnet	Juneau	9/5/2003	36	NE	115		709
520176	40552	Gillnet	Juneau	9/5/2003	36	NE	115		715
520150	40552	Gillnet	Juneau	9/5/2003	36	NE	115		718
520139	40552	Gillnet	Juneau	9/5/2003	36	NE	115		732
520168	40552	Gillnet	Juneau	9/5/2003	36	NE	115		739
520173	40552	Gillnet	Juneau	9/5/2003	36	NE	115		744
520088	40552	Gillnet	Juneau	9/5/2003	36	NE	115		750
520164	40552	Gillnet	Juneau	9/5/2003	36	NE	115		
520198	40371	Gillnet	Juneau	9/8/2003	37	NE	115		673
520206	40552	Gillnet	Juneau	9/8/2003	37	NE	115		661
520226	40552	Gillnet	Juneau	9/8/2003	37	NE	115		706
520222	40552	Gillnet	Juneau	9/8/2003	37	NE	115		790
520265	40371	Gillnet	Juneau	9/11/2003	37	NE	115		740
520349	40552	Gillnet	Juneau	9/11/2003	37	NE	111		701
520334	40552	Gillnet	Juneau	9/11/2003	37	NE	111		749
520296	40552	Gillnet	Juneau	9/11/2003	37	NE	115		676
520320	40552	Gillnet	Juneau	9/11/2003	37	NE	115		684
520250	40552	Gillnet	Juneau	9/11/2003	37	NE	115		685
520269	40552	Gillnet	Juneau	9/11/2003	37	NE	115		694

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Head number	Tag code	Gear	Port	Recovery date	Stat. week	Quad-rant	Dist.	Sub-dist.	Length
520269	40552	Gillnet	Juneau	9/11/2003	37	NE	115		694
520306	40552	Gillnet	Juneau	9/11/2003	37	NE	115		697
520317	40552	Gillnet	Juneau	9/11/2003	37	NE	115		699
520303	40552	Gillnet	Juneau	9/11/2003	37	NE	115		718
520540	40371	Gillnet	Juneau	9/17/2003	38	NE	115		609
520588	40371	Gillnet	Juneau	9/17/2003	38	NE	115		695
520408	40552	Gillnet	Juneau	9/17/2003	38	NE	115		629
520398	40552	Gillnet	Juneau	9/17/2003	38	NE	115		646
520633	40552	Gillnet	Juneau	9/17/2003	38	NE	115		657
520462	40552	Gillnet	Juneau	9/17/2003	38	NE	115		663
520575	40552	Gillnet	Juneau	9/17/2003	38	NE	115		670
520571	40552	Gillnet	Juneau	9/17/2003	38	NE	115		680
520483	40552	Gillnet	Juneau	9/17/2003	38	NE	115		682
520492	40552	Gillnet	Juneau	9/17/2003	38	NE	115		689
520515	40552	Gillnet	Juneau	9/17/2003	38	NE	115		698
520503	40552	Gillnet	Juneau	9/17/2003	38	NE	115		725
520537	40552	Gillnet	Juneau	9/17/2003	38	NE	115		727
520486	40552	Gillnet	Juneau	9/17/2003	38	NE	115		730
520564	40552	Gillnet	Juneau	9/17/2003	38	NE	115		745
517183	40371	Gillnet	Juneau	9/23/2003	39	NE	115		649
517119	40371	Gillnet	Juneau	9/23/2003	39	NE	115		694
517244	40371	Gillnet	Juneau	9/23/2003	39	NE	115		735
517262	40552	Gillnet	Juneau	9/23/2003	39	NE	115		613
517268	40552	Gillnet	Juneau	9/23/2003	39	NE	115		629
517285	40552	Gillnet	Juneau	9/23/2003	39	NE	115		650
517236	40552	Gillnet	Juneau	9/23/2003	39	NE	115		656
517197	40552	Gillnet	Juneau	9/23/2003	39	NE	115		663
517142	40552	Gillnet	Juneau	9/23/2003	39	NE	115		684
517245	40552	Gillnet	Juneau	9/23/2003	39	NE	115		685
517213	40552	Gillnet	Juneau	9/23/2003	39	NE	115		688
517140	40552	Gillnet	Juneau	9/23/2003	39	NE	115		706
517210	40552	Gillnet	Juneau	9/23/2003	39	NE	115		716
517137	40552	Gillnet	Juneau	9/23/2003	39	NE	115		742
517171	40552	Gillnet	Juneau	9/23/2003	39	NE	115		761
520969	40552	Gillnet	Juneau	9/24/2003	39	NE	115		739
517358	40371	Gillnet	Juneau	9/25/2003	39	NE	115		675
530002	40371	Gillnet	Juneau	9/25/2003	39	NE	115		681
530023	40371	Gillnet	Juneau	9/25/2003	39	NE	115		686
530018	40371	Gillnet	Juneau	9/25/2003	39	NE	115		732
520921	40552	Gillnet	Juneau	9/25/2003	39	NE	115		577
520937	40552	Gillnet	Juneau	9/25/2003	39	NE	115		632
517349	40552	Gillnet	Juneau	9/25/2003	39	NE	115		634
517341	40552	Gillnet	Juneau	9/25/2003	39	NE	115		650
517348	40552	Gillnet	Juneau	9/25/2003	39	NE	115		650
517328	40552	Gillnet	Juneau	9/25/2003	39	NE	115		677
530003	40552	Gillnet	Juneau	9/25/2003	39	NE	115		702
520909	40552	Gillnet	Juneau	9/25/2003	39	NE	115		708
517332	40552	Gillnet	Juneau	9/25/2003	39	NE	115		710

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Head number	Tag code	Gear	Port	Recovery date	Stat. week	Quad-rant	Dist.	Sub-dist.	Length
520904	40552	Gillnet	Juneau	9/25/2003	39	NE	115		714
530082	40552	Gillnet	Juneau	9/25/2003	39	NE	115		714
520910	40552	Gillnet	Juneau	9/25/2003	39	NE	115		719
517314	40552	Gillnet	Juneau	9/25/2003	39	NE	115		719
520901	40552	Gillnet	Juneau	9/25/2003	39	NE	115		723
520951	40552	Gillnet	Juneau	9/25/2003	39	NE	115		724
520931	40552	Gillnet	Juneau	9/25/2003	39	NE	115		731
517316	40552	Gillnet	Juneau	9/25/2003	39	NE	115		738
530058	40552	Gillnet	Juneau	9/25/2003	39	NE	115		741
530035	40552	Gillnet	Juneau	9/25/2003	39	NE	115		747
520940	40552	Gillnet	Juneau	9/25/2003	39	NE	115		765
517311	40552	Gillnet	Juneau	9/25/2003	39	NE	115		765
520980	40552	Gillnet	Juneau	9/25/2003	39	NE	115		766
520911	40552	Gillnet	Juneau	9/25/2003	39	NE	115		780
530004	40552	Gillnet	Juneau	9/25/2003	39	NE	115		804
517401	40371	Gillnet	Juneau	9/30/2003	40	NE	115		735
517424	40552	Gillnet	Juneau	9/30/2003	40	NE	115		662
517395	40552	Gillnet	Juneau	9/30/2003	40	NE	115		663
517408	40552	Gillnet	Juneau	9/30/2003	40	NE	115		670
517400	40552	Gillnet	Juneau	9/30/2003	40	NE	115		701
517460	40371	Gillnet	Juneau	10/2/2003	40	NE	115		653
517550	40371	Gillnet	Juneau	10/2/2003	40	NE	115		670
517644	40371	Gillnet	Juneau	10/2/2003	40	NE	115		700
517529	40371	Gillnet	Juneau	10/2/2003	40	NE	115		715
517542	40371	Gillnet	Juneau	10/2/2003	40	NE	115		735
517526	40552	Gillnet	Juneau	10/2/2003	40	NE	115		612
517538	40552	Gillnet	Juneau	10/2/2003	40	NE	115		665
517609	40552	Gillnet	Juneau	10/2/2003	40	NE	115		672
517462	40552	Gillnet	Juneau	10/2/2003	40	NE	115		681
517501	40552	Gillnet	Juneau	10/2/2003	40	NE	115		683
517535	40552	Gillnet	Juneau	10/2/2003	40	NE	115		687
517499	40552	Gillnet	Juneau	10/2/2003	40	NE	115		693
517528	40552	Gillnet	Juneau	10/2/2003	40	NE	115		693
517478	40552	Gillnet	Juneau	10/2/2003	40	NE	115		694
517472	40552	Gillnet	Juneau	10/2/2003	40	NE	115		698
517441	40552	Gillnet	Juneau	10/2/2003	40	NE	115		699
517625	40552	Gillnet	Juneau	10/2/2003	40	NE	115		706
517522	40552	Gillnet	Juneau	10/2/2003	40	NE	115		707
517481	40552	Gillnet	Juneau	10/2/2003	40	NE	115		712
517618	40552	Gillnet	Juneau	10/2/2003	40	NE	115		714
517532	40552	Gillnet	Juneau	10/2/2003	40	NE	115		723
517611	40552	Gillnet	Juneau	10/2/2003	40	NE	115		726
517457	40552	Gillnet	Juneau	10/2/2003	40	NE	115		743
517487	40552	Gillnet	Juneau	10/2/2003	40	NE	115		745
517540	40552	Gillnet	Juneau	10/2/2003	40	NE	115		756
517440	40552	Gillnet	Juneau	10/2/2003	40	NE	115		785
519050	40552	Seine	Excursion Inlet	7/25/2003	30	NE	112	16	738
519122	40371	Seine	Excursion Inlet	8/18/2003	34	NE	112		708

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Head number	Tag code	Gear	Port	Recovery date	Stat. week	Quad-rant	Dist.	Sub-dist.	Length
519109	40552	Seine	Excursion Inlet	8/18/2003	34	NE	112	16	463
519145	40552	Seine	Excursion Inlet	8/20/2003	34	NE	112	16	630
518852	40371	Seine	Petersburg	8/26/2003	35	NE	112		680
242975	40552	Sport	Sitka	8/18/2003	34	NW	113	45	630
149352	40552	Sport	Gustavus	8/19/2003	34	NW	114	23	720
183798	40552	Sport	Elfin Cove	8/20/2003	34	NW	113	91	740
149354	40552	Sport	Gustavus	8/21/2003	34	NW	114	23	700
253757	40371	Sport	Juneau	8/23/2003	34	NE			505
253714	40552	Sport	Juneau	8/23/2003	34	NE			670
234961	40552	Sport	Juneau	8/26/2003	35	NE			770
84820	40552	Sport	Yakutat	8/30/2003	35	NW	183	10	800
149372	40371	Sport	Gustavus	9/4/2003	36	NW	114	23	540
84823	40552	Sport	Yakutat	9/4/2003	36	NW	181	60	765
234744	40552	Sport	Juneau	9/7/2003	37	NE	112	15	680
80834	40552	Sport	Juneau	9/8/2003	37	NE	112	15	775
149374	40552	Sport	Gustavus	9/12/2003	37	NW	114	25	725
55446	40371	Troll	Elfin Cove	7/22/2003	30	NW	114	21	665
180770	40552	Troll	Sitka	7/31/2003	31	NW	113	91	504
55493	40552	Troll	Elfin Cove	8/1/2003	31	NW	114	21	
246773	40552	Troll	Hoonah	8/7/2003	32	NW	114	40	685
55630	40371	Troll	Elfin Cove	8/11/2003	33	NW	114	21	735
519087	40552	Troll	Excursion Inlet	8/13/2003	33	NW	114	25	740
220792	40371	Troll	Sitka	8/14/2003	33	NW	113	45	698
55660	40552	Troll	Elfin Cove	8/15/2003	33	NW	114	21	565
235127	40371	Troll	Sitka	8/15/2003	33	NW	113	45	646
246876	40552	Troll	Hoonah	8/16/2003	33	NW	113		525
246884	40552	Troll	Hoonah	8/16/2003	33	NW	113		560
246866	40552	Troll	Hoonah	8/16/2003	33	NW	113		605
55678	40552	Troll	Elfin Cove	8/18/2003	34	NW	114	21	580
55686	40552	Troll	Elfin Cove	8/18/2003	34	NW	114	21	730
246927	40371	Troll	Hoonah	8/19/2003	34	NW	114	25	620
225738	40552	Troll	Pelican	8/19/2003	34	NW	114	21	700
55690	40371	Troll	Elfin Cove	8/20/2003	34	NW	114	21	680
55693	40552	Troll	Elfin Cove	8/20/2003	34	NW	114	21	690
246983	40371	Troll	Hoonah	8/20/2003	34	NW	113		690
247042	40552	Troll	Hoonah	8/20/2003	34	NW	113		670
247014	40552	Troll	Hoonah	8/20/2003	34	NW	113		680
225756	40552	Troll	Pelican	8/20/2003	34	NW	114	21	620
225758	40552	Troll	Pelican	8/20/2003	34	NW	114	21	662
235216	40298	Troll	Sitka	8/20/2003	34	NW	113	45	749
235163	40552	Troll	Sitka	8/20/2003	34	NW	113		660
235155	40552	Troll	Sitka	8/20/2003	34	NW	113		707
220108	40371	Troll	Sitka	8/22/2003	34	NW	113	93	650
519212	40371	Troll	Excursion Inlet	8/23/2003	34	NW	114		738
225776	40552	Troll	Pelican	8/24/2003	35	NW	114	21	573
225774	40552	Troll	Pelican	8/24/2003	35	NW	114	21	678
55728	40552	Troll	Elfin Cove	8/25/2003	35	NW	114	21	470
55716	40552	Troll	Elfin Cove	8/25/2003	35	NW	114	21	665

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Head number	Tag code	Gear	Port	Recovery date	Stat. week	Quad-rant	Dist.	Sub-dist.	Length
247071	40371	Troll	Hoonah	8/25/2003	35	NW	113		745
247092	40552	Troll	Hoonah	8/25/2003	35	NW	113		650
247087	40552	Troll	Hoonah	8/25/2003	35	NW	113		685
247084	40552	Troll	Hoonah	8/25/2003	35	NW	114	25	740
220859	40371	Troll	Sitka	8/25/2003	35	NW	113	45	695
55733	40371	Troll	Elfin Cove	8/26/2003	35	NW	114	21	595
247134	40371	Troll	Hoonah	8/26/2003	35	NW	113		685
55748	40552	Troll	Elfin Cove	8/27/2003	35	NW	114	21	545
55743	40552	Troll	Elfin Cove	8/27/2003	35	NW	114	21	582
247170	40552	Troll	Hoonah	8/27/2003	35	NE	112	63	675
247162	40552	Troll	Hoonah	8/27/2003	35	NW	113	91	680
247140	40552	Troll	Hoonah	8/27/2003	35	NW	114	27	660
226131	40552	Troll	Pelican	8/27/2003	35	NW	116	12	520
220606	40552	Troll	Sitka	8/27/2003	35	NW	114		701
247172	40552	Troll	Hoonah	8/28/2003	35	NW	114	23	545
226157	40371	Troll	Pelican	8/28/2003	35	NW	113	91	710
519226	40552	Troll	Excursion Inlet	8/29/2003	35	NW	114	25	696
247196	40552	Troll	Hoonah	8/29/2003	35	NW	114	25	680
247209	40552	Troll	Hoonah	8/29/2003	35	NW	114	25	690
247185	40552	Troll	Hoonah	8/29/2003	35	NW	114	25	740
247197	40552	Troll	Hoonah	8/29/2003	35	NW	114	25	780
247210	40552	Troll	Hoonah	8/29/2003	35	NW	114	25	780
226175	40371	Troll	Pelican	8/29/2003	35	NW	114	21	698
226188	40371	Troll	Pelican	8/29/2003	35	NW			642
226174	40552	Troll	Pelican	8/29/2003	35	NW	114	21	630
226178	40552	Troll	Pelican	8/29/2003	35	NW	114	21	696
226190	40552	Troll	Pelican	8/29/2003	35	NW	116	12	522
226193	40552	Troll	Pelican	8/29/2003	35	NW	116	12	644
220678	40552	Troll	Sitka	8/30/2003	35	NW	113		654
247212	40552	Troll	Hoonah	9/1/2003	36	NW	114	23	680
247234	40552	Troll	Hoonah	9/2/2003	36	NW	113	91	605
247238	40552	Troll	Hoonah	9/2/2003	36	NW	113	91	770
247257	40552	Troll	Hoonah	9/2/2003	36	NW	114	25	505
247243	40552	Troll	Hoonah	9/2/2003	36	NW	114	25	645
226236	40552	Troll	Pelican	9/2/2003	36	NW	113	91	697
226248	40552	Troll	Pelican	9/2/2003	36	NW	113	91	770
226267	40552	Troll	Pelican	9/2/2003	36	NW	114	21	753
84726	40552	Troll	Yakutat	9/2/2003	36	NW			640
247339	40552	Troll	Hoonah	9/3/2003	36	NW	114		580
247335	40552	Troll	Hoonah	9/3/2003	36	NW	114		600
247318	40552	Troll	Hoonah	9/3/2003	36	NW	114		655
247308	40552	Troll	Hoonah	9/3/2003	36	NW	114		675
247323	40552	Troll	Hoonah	9/3/2003	36	NW	114		680
247327	40552	Troll	Hoonah	9/3/2003	36	NW	114		700
55777	40552	Troll	Elfin Cove	9/4/2003	36	NW	114	21	670
247355	40371	Troll	Hoonah	9/4/2003	36	NW	114	25	690
247301	40552	Troll	Hoonah	9/4/2003	36	NW	114	25	695
247362	40552	Troll	Hoonah	9/4/2003	36	NW	114		695

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Head number	Tag code	Gear	Port	Recovery date	Stat. week	Quad-rant	Dist.	Sub-dist.	Length
247360	40552	Troll	Hoonah	9/4/2003	36	NW	114		725
84735	40552	Troll	Yakutat	9/4/2003	36	NW	189	30	638
84741	40552	Troll	Yakutat	9/4/2003	36	NW	189	30	750
55790	40552	Troll	Elfin Cove	9/5/2003	36	NW	114	21	683
55784	40552	Troll	Elfin Cove	9/5/2003	36	NW	114	21	695
55798	40552	Troll	Elfin Cove	9/5/2003	36	NW	114	21	740
55787	40552	Troll	Elfin Cove	9/5/2003	36	NW	114	21	750
55791	40552	Troll	Elfin Cove	9/5/2003	36	NW	114	21	795
247370	40371	Troll	Hoonah	9/5/2003	36	NW	114	25	695
247416	40552	Troll	Hoonah	9/5/2003	36	NW	114	25	600
247387	40552	Troll	Hoonah	9/5/2003	36	NW	114	25	655
247427	40552	Troll	Hoonah	9/5/2003	36	NW	114	25	660
247388	40552	Troll	Hoonah	9/5/2003	36	NW	114	25	680
247392	40552	Troll	Hoonah	9/5/2003	36	NW	114	25	690
247412	40552	Troll	Hoonah	9/5/2003	36	NW	114	25	700
247394	40552	Troll	Hoonah	9/5/2003	36	NW	114	25	705
247384	40552	Troll	Hoonah	9/5/2003	36	NW	114	25	710
247431	40552	Troll	Hoonah	9/5/2003	36	NW	114	25	730
247397	40552	Troll	Hoonah	9/5/2003	36	NW	114	25	770
226277	40552	Troll	Pelican	9/5/2003	36	NW	114	21	720
179893	40552	Troll	Port Alexander	9/5/2003	36	NW	113	11	645
226299	40552	Troll	Pelican	9/6/2003	36	NW	114	21	662
226291	40552	Troll	Pelican	9/6/2003	36	NW	114	21	682
226297	40552	Troll	Pelican	9/6/2003	36	NW	114	21	705
247470	40371	Troll	Hoonah	9/7/2003	37	NW	113	95	615
247513	40552	Troll	Hoonah	9/7/2003	37	NW	113	95	680
247508	40552	Troll	Hoonah	9/7/2003	37	NW	113	95	705
247506	40552	Troll	Hoonah	9/7/2003	37	NW	113	95	710
247500	40552	Troll	Hoonah	9/7/2003	37	NW	113	95	715
247472	40552	Troll	Hoonah	9/7/2003	37	NW	113	95	740
235820	40552	Troll	Sitka	9/7/2003	37	NW	113	45	683
235855	40552	Troll	Sitka	9/7/2003	37	NW	113	71	705
55858	40371	Troll	Elfin Cove	9/8/2003	37	NW	114	21	645
55819	40552	Troll	Elfin Cove	9/8/2003	37	NW	114	21	720
55813	40552	Troll	Elfin Cove	9/8/2003	37	NW	114	21	
55828	40552	Troll	Elfin Cove	9/8/2003	37	NW	114	21	
247442	40552	Troll	Hoonah	9/8/2003	37	NE	112	63	710
247441	40552	Troll	Hoonah	9/8/2003	37	NE	112	63	715
247459	40552	Troll	Hoonah	9/8/2003	37	NW	114	25	
226304	40552	Troll	Pelican	9/8/2003	37	NW	113	91	624
226319	40552	Troll	Pelican	9/8/2003	37	NW	114	21	730
226338	40552	Troll	Pelican	9/8/2003	37	NW			614
235515	40552	Troll	Sitka	9/8/2003	37	NW	113	45	712
235911	40552	Troll	Sitka	9/8/2003	37	NW	113	45	733
84767	40371	Troll	Yakutat	9/8/2003	37	NW	189	30	695
84749	40552	Troll	Yakutat	9/8/2003	37	NW	189	30	711
84763	40552	Troll	Yakutat	9/8/2003	37	NW	189	30	724
55875	40371	Troll	Elfin Cove	9/9/2003	37	NW	114	21	740

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Head number	Tag code	Gear	Port	Recovery date	Stat. week	Quad-rant	Dist.	Sub-dist.	Length
55879	40552	Troll	Elfin Cove	9/9/2003	37	NW	114	21	600
55878	40552	Troll	Elfin Cove	9/9/2003	37	NW	114	21	680
55891	40552	Troll	Elfin Cove	9/9/2003	37	NW	114	21	690
55882	40552	Troll	Elfin Cove	9/9/2003	37	NW	114	21	715
226361	40371	Troll	Pelican	9/9/2003	37	NW	113	91	692
226407	40552	Troll	Pelican	9/9/2003	37	NW	113	91	682
247537	40371	Troll	Hoonah	9/10/2003	37	NW	113	91	630
247546	40552	Troll	Hoonah	9/10/2003	37	NW	114	25	700
226439	40371	Troll	Pelican	9/10/2003	37	NW	114	21	735
27059	40552	Troll	Elfin Cove	9/11/2003	37	NW	114	21	700
27058	40552	Troll	Elfin Cove	9/11/2003	37	NW	114	21	720
27057	40552	Troll	Elfin Cove	9/11/2003	37	NW	114	21	725
27063	40552	Troll	Elfin Cove	9/11/2003	37	NW	114	21	760
27061	40552	Troll	Elfin Cove	9/11/2003	37	NW	114	21	770
247559	40371	Troll	Hoonah	9/11/2003	37	NE	112	63	725
247547	40552	Troll	Hoonah	9/11/2003	37	NE	112	63	765
247576	40552	Troll	Hoonah	9/11/2003	37	NW	114	25	660
247564	40552	Troll	Hoonah	9/11/2003	37	NW	114		690
247571	40552	Troll	Hoonah	9/11/2003	37	NW	114		750
84777	40552	Troll	Yakutat	9/11/2003	37	NW			668
27086	40552	Troll	Elfin Cove	9/12/2003	37	NW	114	21	730
247594	40371	Troll	Hoonah	9/12/2003	37	NW	114	25	640
247596	40371	Troll	Hoonah	9/12/2003	37	NW	114	25	710
247593	40371	Troll	Hoonah	9/12/2003	37	NW	114	25	720
247611	40552	Troll	Hoonah	9/12/2003	37	NW	114	21	675
247610	40552	Troll	Hoonah	9/12/2003	37	NW	114	21	730
247619	40552	Troll	Hoonah	9/12/2003	37	NW	114	25	705
247603	40552	Troll	Hoonah	9/12/2003	37	NW	114	25	730
226467	40552	Troll	Pelican	9/12/2003	37	NW	114	21	663
226482	40552	Troll	Pelican	9/12/2003	37	NW	114	21	670
247631	40552	Troll	Hoonah	9/13/2003	37	NW	114	25	585
247640	40552	Troll	Hoonah	9/13/2003	37	NW	114	25	740
27092	40552	Troll	Elfin Cove	9/14/2003	38	NW	114	21	650
27089	40552	Troll	Elfin Cove	9/14/2003	38	NW	114	21	760
247696	40371	Troll	Hoonah	9/15/2003	38	NW	114	21	505
247704	40371	Troll	Hoonah	9/15/2003	38	NW	114	21	650
247663	40371	Troll	Hoonah	9/15/2003	38	NW	114	21	660
247650	40552	Troll	Hoonah	9/15/2003	38	NE	112	63	685
247647	40552	Troll	Hoonah	9/15/2003	38	NE	112	63	700
247648	40552	Troll	Hoonah	9/15/2003	38	NE	112	63	730
247664	40552	Troll	Hoonah	9/15/2003	38	NW	114	21	635
247665	40552	Troll	Hoonah	9/15/2003	38	NW	114	21	695
247695	40552	Troll	Hoonah	9/15/2003	38	NW	114	21	700
247669	40552	Troll	Hoonah	9/15/2003	38	NW	114	21	760
247656	40552	Troll	Hoonah	9/15/2003	38	NW	114	21	765
226492	40298	Troll	Pelican	9/15/2003	38	NW	116	11	753
226490	40371	Troll	Pelican	9/15/2003	38	NW	114	21	605
84799	40552	Troll	Yakutat	9/15/2003	38	NW	189	30	705

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Head number	Tag code	Gear	Port	Recovery date	Stat. week	Quad-rant	Dist.	Sub-dist.	Length
84790	40552	Troll	Yakutat	9/15/2003	38	NW	189	30	750
27110	40371	Troll	Elfin Cove	9/16/2003	38	NW	114	21	675
27114	40552	Troll	Elfin Cove	9/16/2003	38	NW	114	21	685
27099	40552	Troll	Elfin Cove	9/16/2003	38	NW	114	21	705
27101	40552	Troll	Elfin Cove	9/16/2003	38	NW	114	21	755
226497	40552	Troll	Pelican	9/16/2003	38	NW	114	21	545
235786	40371	Troll	Sitka	9/16/2003	38	NW	113	45	566
247780	40371	Troll	Hoonah	9/17/2003	38	NW	114	25	730
247774	40552	Troll	Hoonah	9/17/2003	38	NW	114	25	605
247776	40552	Troll	Hoonah	9/17/2003	38	NW	114	25	655
247790	40552	Troll	Hoonah	9/17/2003	38	NW	114	25	660
247784	40552	Troll	Hoonah	9/17/2003	38	NW	114	25	670
247795	40552	Troll	Hoonah	9/17/2003	38	NW	114	25	670
247801	40552	Troll	Hoonah	9/17/2003	38	NW	114	25	690
247793	40552	Troll	Hoonah	9/17/2003	38	NW	114	25	700
247779	40552	Troll	Hoonah	9/17/2003	38	NW	114	25	
247715	40552	Troll	Hoonah	9/17/2003	38	NW	114		655
247749	40552	Troll	Hoonah	9/17/2003	38	NW	114		655
247740	40552	Troll	Hoonah	9/17/2003	38	NW	114		695
27118	40552	Troll	Elfin Cove	9/18/2003	38	NW	114	21	684
247807	40552	Troll	Hoonah	9/18/2003	38	NW	114	23	660
247834	40552	Troll	Hoonah	9/18/2003	38	NW	114	25	635
247846	40552	Troll	Hoonah	9/18/2003	38	NW	114	25	655
247828	40552	Troll	Hoonah	9/18/2003	38	NW	114	25	660
247830	40552	Troll	Hoonah	9/18/2003	38	NW	114	25	680
247843	40552	Troll	Hoonah	9/18/2003	38	NW	114	25	710
247820	40552	Troll	Hoonah	9/18/2003	38	NW	114	25	720
247826	40552	Troll	Hoonah	9/18/2003	38	NW	114	25	770
248231	40552	Troll	Sitka	9/18/2003	38	NW	114	21	675
248265	40552	Troll	Sitka	9/20/2003	38	NW	114	25	653
248255	40552	Troll	Sitka	9/20/2003	38	NW	114	25	667
248259	40552	Troll	Sitka	9/20/2003	38	NW	114	25	702
88415	40552	Troll	Yakutat	9/20/2003	38	NW			711
88411	40552	Troll	Yakutat	9/20/2003	38	NW			715
226536	40552	Troll	Pelican	9/22/2003	39	NW	114	21	638
226541	40552	Troll	Pelican	9/22/2003	39	NW	114	21	720
248289	40552	Troll	Sitka	9/23/2003	39	NW	114	25	692
226553	40552	Troll	Pelican	9/24/2003	39	NW	114	21	685
226573	40552	Troll	Pelican	9/25/2003	39	NW	114	21	615
226581	40552	Troll	Pelican	9/25/2003	39	NW	114	21	628
226595	40552	Troll	Pelican	10/1/2003	40	NW	114	21	700
226594	40552	Troll	Pelican	10/1/2003	40	NW	114	21	705
534393	40552	Troll	Petersburg	10/1/2003	40	NW	114	25	723
248307	40552	Troll	Sitka	10/1/2003	40	NW	114	60	665
248313	40552	Troll	Sitka	10/1/2003	40	NW	114	60	731
55919	40371	Fish wheels	Chilkat River	8/9/2003	32	NE	115	32	445
55920	40552	Fish wheels	Chilkat River	8/20/2003	34	NE	115	32	440
222726	40552	Fish wheels	Chilkat River	8/23/2003	34	NE	115	32	360

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Head number	Tag code	Gear	Port	Recovery date	Stat. week	Quad-rant	Dist.	Sub-dist.	Length
222729	40371	Fish wheels	Chilkat River	8/29/2003	35	NE	115	32	495
222728	40371	Fish wheels	Chilkat River	8/29/2003	35	NE	115	32	650
222730	40552	Fish wheels	Chilkat River	8/30/2003	35	NE	115	32	405
222731	40552	Fish wheels	Chilkat River	8/31/2003	36	NE	115	32	610
222732	40552	Fish wheels	Chilkat River	9/2/2003	36	NE	115	32	435
222733	40552	Fish wheels	Chilkat River	9/3/2003	36	NE	115	32	410
182254	40371	Fish wheels	Chilkat River	9/5/2003	36	NE	115	32	395
222735	40371	Fish wheels	Chilkat River	9/5/2003	36	NE	115	32	525
182255	40552	Fish wheels	Chilkat River	9/5/2003	36	NE	115	32	440
182256	40552	Fish wheels	Chilkat River	9/5/2003	36	NE	115	32	635
222734	40552	Fish wheels	Chilkat River	9/5/2003	36	NE	115	32	650
182257	40552	Fish wheels	Chilkat River	9/7/2003	37	NE	115	32	585
182258	40552	Fish wheels	Chilkat River	9/9/2003	37	NE	115	32	670
222712	40552	Fish wheels	Chilkat River	9/10/2003	37	NE	115	32	540
222713	40552	Fish wheels	Chilkat River	9/12/2003	37	NE	115	32	495
222715	40552	Fish wheels	Chilkat River	9/13/2003	37	NE	115	32	560
222714	40552	Fish wheels	Chilkat River	9/13/2003	37	NE	115	32	590
222716	40552	Fish wheels	Chilkat River	9/13/2003	37	NE	115	32	625
149989	40552	Fish wheels	Chilkat River	9/15/2003	38	NE	115	32	560
55908	40371	Fish wheels	Chilkat River	9/16/2003	38	NE	115	32	635
55952	40552	Fish wheels	Chilkat River	9/16/2003	38	NE	115	32	595
222717	40552	Fish wheels	Chilkat River	9/19/2003	38	NE	115	32	700
222718	40552	Fish wheels	Chilkat River	9/20/2003	38	NE	115	32	575
222719	40552	Fish wheels	Chilkat River	9/21/2003	39	NE	115	32	630
222720	40552	Fish wheels	Chilkat River	9/21/2003	39	NE	115	32	680
55977	40552	Fish wheels	Chilkat River	9/23/2003	39	NE	115	32	635
222721	40552	Fish wheels	Chilkat River	9/23/2003	39	NE	115	32	700
222723	40552	Fish wheels	Chilkat River	9/25/2003	39	NE	115	32	545
222722	40552	Fish wheels	Chilkat River	9/25/2003	39	NE	115	32	630
222724	40552	Fish wheels	Chilkat River	9/25/2003	39	NE	115	32	660
222725	40371	Fish wheels	Chilkat River	9/26/2003	39	NE	115	32	600
55955	40552	Fish wheels	Chilkat River	9/26/2003	39	NE	115	32	590
55954	40552	Fish wheels	Chilkat River	9/26/2003	39	NE	115	32	615
55953	40552	Fish wheels	Chilkat River	9/26/2003	39	NE	115	32	670
55956	35605	Fish wheels	Chilkat River	9/28/2003	40	NE	115	32	665
55957	40552	Fish wheels	Chilkat River	9/29/2003	40	NE	115	32	640
55958	40552	Fish wheels	Chilkat River	9/30/2003	40	NE	115	32	520
55960	40552	Fish wheels	Chilkat River	9/30/2003	40	NE	115	32	590
55959	40552	Fish wheels	Chilkat River	9/30/2003	40	NE	115	32	610
55962	40552	Fish wheels	Chilkat River	9/30/2003	40	NE	115	32	610
55961	40552	Fish wheels	Chilkat River	9/30/2003	40	NE	115	32	620
55964	40371	Fish wheels	Chilkat River	10/1/2003	40	NE	115	32	520
55963	40371	Fish wheels	Chilkat River	10/1/2003	40	NE	115	32	620
55965	40552	Fish wheels	Chilkat River	10/1/2003	40	NE	115	32	500
55966	40552	Fish wheels	Chilkat River	10/2/2003	40	NE	115	32	705
149986	40371	Fish wheels	Chilkat River	10/3/2003	40	NE	115	32	390
149992	40371	Fish wheels	Chilkat River	10/3/2003	40	NE	115	32	580
55967	40552	Fish wheels	Chilkat River	10/3/2003	40	NE	115	32	630

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Head number	Tag code	Gear	Port	Recovery date	Stat. week	Quad-rant	Dist.	Sub-dist.	Length
55969	40552	Fish wheels	Chilkat River	10/3/2003	40	NE	115	32	630
55968	40552	Fish wheels	Chilkat River	10/3/2003	40	NE	115	32	670
149994	40298	Fish wheels	Chilkat River	10/4/2003	40	NE	115	32	680
149993	40552	Fish wheels	Chilkat River	10/4/2003	40	NE	115	32	655
149995	40552	Fish wheels	Chilkat River	10/4/2003	40	NE	115	32	660
222744	40371	Fish wheels	Chilkat River	10/5/2003	41	NE	115	32	620
149960	40371	Fish wheels	Chilkat River	10/5/2003	41	NE	115	32	635
149959	40552	Fish wheels	Chilkat River	10/5/2003	41	NE	115	32	630
222746	40552	Fish wheels	Chilkat River	10/5/2003	41	NE	115	32	650
222745	40552	Fish wheels	Chilkat River	10/5/2003	41	NE	115	32	655
55981	40371	Fish wheels	Chilkat River	10/6/2003	41	NE	115	32	540
55979	40552	Fish wheels	Chilkat River	10/6/2003	41	NE	115	32	580
55978	40552	Fish wheels	Chilkat River	10/6/2003	41	NE	115	32	680
55980	40552	Fish wheels	Chilkat River	10/6/2003	41	NE	115	32	700
55982	40552	Fish wheels	Chilkat River	10/7/2003	41	NE	115	32	650
222747	40552	Fish wheels	Chilkat River	10/8/2003	41	NE	115	32	580
222749	40371	Fish wheels	Chilkat River	10/9/2003	41	NE	115	32	635
222748	40552	Fish wheels	Chilkat River	10/9/2003	41	NE	115	32	680
55985	40552	Fish wheels	Chilkat River	10/10/2003	41	NE	115	32	635
55986	40552	Fish wheels	Chilkat River	10/10/2003	41	NE	115	32	670
55983	40552	Fish wheels	Chilkat River	10/10/2003	41	NE	115	32	675
55984	40552	Fish wheels	Chilkat River	10/10/2003	41	NE	115	32	695
55987	40552	Fish wheels	Chilkat River	10/11/2003	41	NE	115	32	610
55988	40552	Fish wheels	Chilkat River	10/11/2003	41	NE	115	32	650
222750	40552	Fish wheels	Chilkat River	10/19/2003	43	NE	115	32	630
SELECT RECOVERIES									
55989	40552	Chilkat recovery	Spring Cr.	10/30/2003	44	NE	115	32	630
221462	40371	Chilkat recovery	Jacquot's Landing	11/13/2003	46	NE	115	32	580
221463	40552	Chilkat recovery	37 M Cr.	11/13/2003	46	NE	115	32	590
221464	40552	Chilkat recovery	Jacquot's Landing	11/18/2003	47	NE	115	32	555
221424	40552	Chilkat recovery	Jacquot's Landing	11/28/2003	48	NE	115	32	660
221423	40552	Chilkat recovery	Jacquot's Landing	11/28/2003	48	NE	115	32	690
73202	40552	Chilkat recovery	Jacquot's Landing	11/30/2003	49	NE	115	32	630
73203	40552	Chilkat recovery	Jacquot's Landing	11/30/2003	49	NE	115	32	650
55990	40371	Chilkat recovery	Clear Cr.	1/16/2004	3	NE	115	32	580
80830	40552	Sport	Juneau	9/1/2003	36	NE	112	16	
247368	40371	Troll	Hoonah	9/4/2003	36	NW	114	25	650
247439	40371	Troll	Hoonah	9/4/2003	36	NW	114	25	660
902994	40371	Troll	Sitka	9/17/2003	38	NW	114	25	
903001	40371	Troll	Sitka	9/17/2003	38	NW	114	25	
902988	40552	Troll	Sitka	9/17/2003	38	NW	114	25	
902992	40552	Troll	Sitka	9/17/2003	38	NW	114	25	
902998	40552	Troll	Sitka	9/17/2003	38	NW	114	25	
903005	40552	Troll	Sitka	9/17/2003	38	NW	114	25	
VOLUNTARY RECOVERIES									
73201	40552	Sport	Chilkat River	10/21/2003	43	NE	115	32	
222742	40552	Sport	Chilkat River	10/24/2003	43	NE	115	32	
222741	40552	Sport	Chilkat River	10/27/2003	44	NE	115	32	

Appendix A2.–Upstream movement data and aerial survey locations of radio tagged coho salmon that did not spawn in the Chilkat River drainage, 2003.

Fish number	Date tagged	Days to pass upstream at MP 9	Aerial survey locations (river and km upstream of mouth) **M** = Mort signal detected									Fate
			9/9/03	9/18/03	9/25/03	10/10/03	10/27/03	11/10/03	12/4/03	12/20/03	1/21/04	
81	9/26	0.4				Not located	Not located	Not located	Not located	Not located	Not located	Unknown.
12	9/2	1.5	Tag recovered	Tag recovered	Tag recovered	Tag recovered	Tag recovered	Tag recovered	Tag recovered	Tag recovered	Tag recovered	Reported fishery.
20	9/5	1.1	Chilkat 23	Not located	Tag recovered	Tag recovered	Tag recovered	Tag recovered	Tag recovered	Tag recovered	Tag recovered	Reported fishery.
83	9/26	0.1				Chilkat 29	Chilkat 37	Chilkat 34 **M**	Chilkat 34	Chilkat 34	Tag recovered	Reported fishery.
101	10/3	0.4				Chilkat 23	Not located	Tag recovered	Tag recovered	Tag recovered	Tag recovered	Reported fishery.
13	9/2	1.3	Chilkat 40	Chilkat 47 **M**	Chilkat 47 **M**	Tag recovered	Tag recovered	Tag recovered	Tag recovered	Tag recovered	Tag recovered	Pre-spawning mortality or tag regurgitation. Stump Lake, Chilkat E Channel.
26	9/8	1.0	Chilkat 19	Chilkat 19	Chilkat 19 **M**	Chilkat 19 **M**	Chilkat 19 **M**	Chilkat 19 **M**	Chilkat 19 **M**	Chilkat 19 **M**	Chilkat 19 **M**	Pre-spawning mortality or tag regurgitation. Tag located in Chilkat River main channel.
69	9/22	0.4			Chilkat 27	Chilkat 37	Chilkat 34	Tag recovered	Tag recovered	Tag recovered	Tag recovered	Pre-spawning mortality or tag regurgitation. Tsirku R. delta.
70	9/22	0.3			Chilkat 27	Chilkat 32	Chilkat 32	Chilkat 32	Tsirku 1 **M**	Tsirku 1 **M**	Tsirku 1 **M**	Pre-spawning mortality or tag regurgitation. Tag located in Tsirku R. delta.
110	10/6	1.6				Chilkat 21	Chilkat 34 **M**	Tag recovered	Tag recovered	Tag recovered	Tag recovered	Pre-spawning mortality or tag regurgitation. Tsirku/Chilkat confluence.
77	9/23	0.3			Chilkat 20	Not located	Not located	Not located	Davidson River, Chilkat Inlet **M**	Not in survey area	Not in survey area	Backout. Downstream at MP 9 on 9/30.

Appendix A3.–Stationary tracking data for 112 radio tagged coho salmon that spawned in the Chilkat River drainage, 2003.

Fish	Tagging			First upstream passage date at tracking station (Shading indicates subsequent downstream passage)					Transit time (days)				Spawning
Num-ber	Date	FW	MP 9	Chilkat Lake	Tsirku River	Klehini River	Wells Bridge	Jacquot's Landing	Tag site to MP 9	MP 9 to Wells	MP 9 to Kle-hini	Wells to Jacquot's	destination
Upper Chilkat River drainage spawners													
1	8/13	1	8/13				8/24	8/27	0.2	10.4		3.9	Tahini
7	8/26	2	8/26				9/6	9/13	0.3	10.6		7.4	Tahini
8	8/26	2	8/27				9/1	9/6	1.4	4.6		5.5	Tahini
19	9/3	1	9/3				9/9	9/14	0.1	6.1		4.9	Tahini
21	9/5	2	9/5				9/21	9/23	0.3	16.1		2.1	Tahini
22	9/5	2	9/7				9/18	9/21	1.6	11.7		3.0	Tahini
28	9/8	2	9/8				9/12	9/14	0.3	3.7		2.0	Tahini
29	9/8	2	9/8				9/16	9/17	0.2	8.1		1.0	Tahini
32	9/10	2	9/10				9/19	9/21	0.4	9.1		1.5	Tahini
39	9/11	2	9/11				9/21	9/22	0.6	9.5		1.3	Tahini
71	9/23	1	9/24				10/1	10/7	1.3	7.0		6.0	Tahini
2	8/20	2	8/22				9/6	9/15	2.5	14.5		9.2	Assign.
3	8/22	2	8/23				9/9	9/16	1.0	17.0		7.1	Assign.
5	8/25	2	8/26				9/8	9/12	0.8	12.8		4.5	Assign.
6	8/26	2	8/26				9/6	9/13	0.4	11.2		6.5	Assign.
10	8/27	2	8/28				9/9	9/11	0.6	12.4		1.9	Assign.
15	9/3	2	9/4				9/10	9/15	0.6	6.8		4.7	Assign.
23	9/5	2	9/7				9/19	9/21	2.6	11.0		2.3	Assign.
37	9/10	2	9/10				9/21	9/25	0.6	10.6		4.3	Assign.
42	9/11	2	9/14				9/25	9/27	3.4	11.0		2.0	Assign.
43	9/15	1	9/16				9/27		1.2	10.9			Assign.
46	9/15	1	9/15				9/21	9/24	0.2	6.1		2.8	Assign.
50	9/15	1	9/15				9/20	9/21	0.3	5.1		0.6	Assign.
64	9/19	2	9/20				9/25	9/27	1.0	5.2		1.8	Assign.
82	9/26	1	9/26				10/1		0.3	4.7			Assign.
93	9/29	1	9/29				10/20		0.3	21.1			Assign.
100	10/3	1	10/3				10/19		0.4	15.7			Homest.
74	9/23	1	9/23				10/5		0.5	11.9			Mule M.
120	10/16	1	10/18				11/28		1.6	41.8			Mule M.
31	9/8	2	9/9				9/24	9/29	1.4	14.7		4.9	Kelsall
35	9/10	2	9/11				9/22	9/27	1.0	11.4		4.7	Kelsall
36	9/10	2	9/11				9/26	10/5	0.7	15.3		8.9	Kelsall
41	9/11	2	9/11				9/25	9/29	0.3	13.8		4.3	Kelsall
55	9/17	2	9/18				9/25	9/27	1.0	7.3		2.1	Kelsall
73	9/23	1	9/24				10/13		1.4	18.6			Kelsall
92	9/29	1	9/29				10/23		0.1	23.7			Kelsall
94	9/29	1	9/29				10/20		0.2	21.1			Kelsall

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Fish Number	Tagging Date	FW	First upstream passage date at tracking station (Shading indicates subsequent downstream passage) MP 9	Chilkat Lake	Tsirku River	Klehini River	Wells Bridge	Jacquot's Landing	Transit time (days) Tag site to MP 9	MP 9 to Wells	MP 9 to Klehini	Wells to Jacquot's	Spawning destination
Klehini River drainage spawners													
4	8/22	2	8/23			9/29	9/28		0.6	36.8	37.3		37-Mile
27	9/8	2	9/8			9/30			0.3		22.1		37-Mile
34	9/10	2	9/11			10/12			1.2		31.2		37-Mile
87	9/26	1	9/26			10/18			0.2		21.3		37-Mile
72	9/23	1	9/25			11/9			2.3		45.2		Bear Cr
45	9/15	1	9/20			10/23	10/18		5.0	28.5	33.5		Herman
60	9/19	2	9/20			10/9			0.9		19.5		Herman
33	9/10	2	9/11			9/28			1.0		17.3		Klehini
48	9/15	1	9/16			10/8			1.1		22.4		Klehini
63	9/19	2	9/20			11/22			1.0		63.2		Klehini
107	10/6	2	10/13						7.3				Klehini
Tsirku River drainage spawners													
54	9/17	2	9/17	9/27					0.5				Chil Lk NW
89	9/29	1	9/29		10/27				0.2				Chil Lk NW
109	10/6	2	10/7	10/20					0.7				Chil Lk NW
62	9/19	2	9/20	10/2					1.1				Chil Lk SE
66	9/22	2	9/22	10/11					0.3				Chil Lk SE
111	10/6	2	10/9		11/6				2.6				Chil Lk SE
119	10/16	1	10/16		11/9				0.6				Chil Lk SE
14	9/3	2	9/5						2.5				Clear Cr
108	10/6	2	10/8		12/29				2.5				Clear Cr
112	10/8	2	10/10		12/4				2.1				Clear Cr
113	10/8	2	10/8		12/18				0.5				Clear Cr
115	10/8	2	10/10		10/26				1.7				Clear Cr
116	10/13	1	10/15		12/23				2.5				Clear Cr
123	10/20	1	10/20		11/15				0.4				Clear Cr
11	9/2	2	9/4						2.5				L Salmon
16	9/3	2	9/5						2.2				L Salmon
25	9/8	2	9/8						0.4				L Salmon
47	9/15	1	9/16						1.2				L Salmon
53	9/17	2	9/18						1.2				L Salmon
56	9/17	2	9/18						0.6				L Salmon
59	9/19	2	9/20						1.1				L Salmon
68	9/22	2	9/22						0.3				L Salmon
85	9/26	1	9/26						0.1				L Salmon

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Fish	Tagging			First upstream passage date at tracking station (Shading indicates subsequent downstream passage)					Transit time (days)				Spawning
Num-ber	Date	FW	MP 9	Chilkat Lake	Tsirku River	Klehini River	Wells Bridge	Jacquot's Landing	Tag site to MP 9	MP 9 to Wells	MP 9 to Kle-hini	Wells to Jacquot's	desti-nation
86	9/26	1	9/26						0.2				L Salmon
99	10/1	2	10/1						0.3				L Salmon
114	10/8	2	10/8		10/27				0.5				L Salmon
44	9/15	1	9/15						0.1				Spring Cr
Lower Chilkat River drainage spawners													
40	9/11	2	9/14				9/18		3.3	4.2			Bear Fl
51	9/17	2	9/20				10/2		3.4	11.7			Bear Fl
80	9/26	1	9/26				9/29		0.3	2.8			Bear Fl
88	9/26	1	9/26				10/11		0.5	14.6			Bear Fl
95	10/1	2	10/2				10/19		1.5	16.9			Bear Fl
102	10/3	1	10/5				11/13		2.0	39.4			Bear Fl
103	10/3	1	10/3				11/19		0.1	47.3			Bear Fl
105	10/3	1	10/3		12/26		12/27		0.2	84.9			Bear Fl
118	10/13	1	10/13				11/25		0.4	43.1			Bear Fl
9	8/27	2	8/27				9/16		0.4	19.5			EChann
18	9/3	1	9/4				9/13		1.2	8.8			EChann
24	9/5	2	9/6				9/21	10/5	1.5	14.7		13.7	Muskrat
30	9/8	2	9/9				9/22		1.4	13.0			Jacquot's
38	9/11	2	9/11				9/22		0.4	11.0			Jacquot's
52	9/17	2	9/18				9/26	9/28	1.0	8.3		1.9	Jacquot's
79	9/23	1	9/25				11/9		2.3	44.4			Jacquot's
91	9/29	1	9/29				10/25		0.2	26.2			Jacquot's
106	10/3	1	10/5				10/25		2.2	20.3			Jacquot's
17	9/3	1	9/4				9/21	10/3	1.0	17.3		12.2	Jacquot's
49	9/15	1	9/15				9/27		0.3	12.0			Jacquot's
57	9/17	2	9/17				9/23	9/27	0.5	6.1		3.1	Jacquot's
58	9/17	2	9/18				9/27	10/6	1.4	8.9		9.0	Jacquot's
67	9/22	2	9/22				10/6		0.5	13.5			Jacquot's
90	9/29	1	9/29				10/19		0.2	19.4			Jacquot's
61	9/19	2	9/21						1.8				Takhin
75	9/23	1	10/3						9.7				Takhin
76	9/23	1	9/25						2.4				Takhin
78	9/23	1	9/27						4.2				Takhin
96	10/1	2	10/12						10.6				Takhin
65	9/22	2	9/30						7.6				Chilk 15
84	9/26	1	9/26						0.2				Chilk 14
97	10/1	2	10/2						0.8				Chilk 18
98	10/1	2	10/2						1.4				Chilk 20
104	10/3	1	10/8						5.3				Chilk 14
117	10/13	1	10/14						0.7				Chilk 17
121	10/16	1	10/17						1.5				Chilk 17
122	10/20	1	10/20						0.4				Chilk 17

Appendix A4.–Locations of radio tagged coho salmon by aerial and ground surveys, September 2003 through June 2004.

Fish Number	Date Tagged	Aerial survey locations (river and km upstream from river mouth)									Ground survey location	Ground survey date	Tag recovered	Spawning area
		9/9/03	9/18/03	9/25/03	10/10/03	10/27/03	11/10/03	12/4/03	12/20/03	1/21/04				
1	8/13	Chil 57	Tahi 3	Tahi 2	Tahi 3	Tahi 3 M	Rec.	Rec.	Rec.	Rec.	Tahi	10/27/03	y	Tahi
7	8/26	Chil 42	Tahi 1	Rec.	Rec.	Rec.	Rec.	Rec.	Rec.	Rec.	Tahi	9/22/03	y	Tahi
8	8/26	Chil 53	Chil 61	Tahi 2 wk	Tahi 2	Tahi 2 M	Rec.	Rec.	Rec.	Rec.	Tahi	10/28/03	y	Tahi
19	9/3	Chil 37	Chil 58	Tahi 2	Tahi 3	Tahi 5	Tahi 3	Chil 63 M	Chil 63 M	Chil 63 M	Tahi	10/21/03	n	Tahi
21	9/5	Chil 18	Chil 19	Chil 54	Tahi 2	Tahi 3 M	Rec.	Rec.	Rec.	Rec.	Tahi	10/27/03	y	Tahi
22	9/5	Chil 19	Chil 34	Chil 56	Tahi 2	Chil 60 M	Chil 61 M	Chil 61 M	Chil 60 M	Chil 60 M			n	Tahi
28	9/8	Chil 18	Chil 51	Chil 53	Tahi 2	Rec.	Rec.	Rec.	Rec.	Rec.	Tahi	10/22/03	y	Tahi
29	9/8	Chil 26	Chil 58	Chil 55	Tahi 3 wk	Chil 63	Chil 61 M	Chil 61 M	Chil 60 M	Chil 60 M			n	Tahi
32	9/10		Chil 27	Tahi 2 wk	Tahi 2	Rec.	Rec.	Rec.	Rec.	Rec.	Tahi	10/10/03	y	Tahi
39	9/11		Not loc.	Chil 55	Tahi 3	Tahi 2 M	Rec.	Rec.	Rec.	Rec.	Tahi	10/27/03	y	Tahi
71	9/23			Chil 19	Chil 56	Tahi 3	Tahi 3	Tahi 2	Assg 2	Tahi 2 M			n	Tahi
2	8/20	Chil 43	Assg 2	Assg 3	Assg 3 wk	Rec.	Rec.	Rec.	Rec.	Rec.	Assg	10/21/03	y	Assg
3	8/22	Chil 40	Chil 53	Chil 56	Assg 2 wk	Assg 3	Assg 3	Assg 3 M	Assg 3 M	Assg 3 M	Assg	10/21/03	y	Assg
5	8/25	Chil 47	Assg 2	Assg 2	Assg 2 M	Chil 58 M	Assg 2 M wk	Not loc.	Not loc.	Not loc.	Assg	10/21/03	n	Assg
6	8/26	Chil 47	Assg 2	Assg 2	Assg 2 M	Rec.	Rec.	Rec.	Rec.	Rec.	Assg	10/21/03	y	Assg
10	8/27	Chil 43	Assg 2	Assg 3 wk	Chil 56	Rec.	Rec.	Rec.	Rec.	Rec.	Assg	10/21/03	y	Assg
15	9/3	Chil 35	Assg 2	Assg 3	Assg 2	Rec.	Rec.	Rec.	Rec.	Rec.	Assg	10/21/03	y	Assg
23	9/5	Chil 18	Chil 34	Assg 3 wk	Assg 3 wk	Rec.	Rec.	Rec.	Rec.	Rec.	Assg	10/14/03	y	Assg
37	9/10		Not loc.	Jacq	Assg 2	Assg 3	Assg 3	Assg 2 M	Assg 2 M	Assg 3 M	Assg	5/13/04	y	Assg
42	9/11		Chil 19	Chil 31 wk	Assg 3 wk	Assg 3	Assg 3 M	Assg 3 M	Assg 3 M	Assg 3 M	Assg (live)	10/21/03	n	Assg
43	9/15		Not loc.	Chil 27 wk	Chil 43	Assg 3	Assg 3	Assg 3 M	Assg 3 M	Assg 3 M	Assg	5/13/04	y	Assg
46	9/15		Chil 24	Chil 55	Assg 3 wk	Rec.	Rec.	Rec.	Rec.	Rec.	Assg	10/14/03	y	Assg
50	9/15		Not loc.	Chil 34	Not loc.	Assg 3	Assg 3	Assg 3 M	Assg 3 M	Assg 3 M			n	Assg
64	9/19			Chil 35	Assg 3 Wk	Assg 3	Assg 3 M	Assg 3 M	Assg 2 M	Assg 3 M	Assg (live)	10/29/03	n	Assg
82	9/26				Jacq	Assg 3	Assg 3	Assg 3 M	Assg 3 M	Assg 3 M	Assg (live)	10/21/03	n	Assg
93	9/29				Chil 29	Jacq	Kels 1	Assg 3	Assg 3 M	Assg 3 M	Assg	5/13/04	y	Assg
100	10/3				Chil 27	Home 2	Home 2 M	Home 2 M	Home 2 M	Home 2 M			n	Home
74	9/23			Chil 14 wk	Chil 42	Chil 51	Chil 48	Jacq	Jacq	Mule	Mule	2/27/04	y	Mule
120	10/16					Chil 24	Chil 35	Chil 47	Jacq	Mule	Mule	2/27/04	y	Mule

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Fish Number	Date Tagged	Aerial survey locations (river and km upstream from river mouth)									Ground survey location	Ground survey date	Tag recovered	Spawning area
		9-Sep	18-Sep	25-Sep	10-Oct	27-Oct	10-Nov	4-Dec	20-Dec	21-Jan				
31	9/8	Chil 13	Chil 24	Chil 40	Kels 3	Kels 3 M	Rec.	Rec.	Rec.	Rec.	Kels	10/30/03	y	Kels
35	9/10		Chil 26	Chil 45	Kels 3	Chil 51	Rec.	Rec.	Rec.	Rec.	Kels	11/17/03	y	Kels
36	9/10		Not loc.	Chil 29 Wk	Kels 1	Chil 51	Rec.	Rec.	Rec.	Rec.	Jacq	10/30/03	y	Kels
41	9/11		Not loc.	Chil 39	Chil 51	Kels 1	Kels 1	Kels 3 M	Kels 1 M	Kels 1 M	Kels	8/15/03	y	Kels
55	9/17			Chil 14	Chil 37	Not loc.	Not loc.	Not loc.	Kels 11 M	Not in area			n	Kels
73	9/23			Chil 18 wk	Chil 35	Jacq	Kels 1	Jacq	Jacq	Jacq M	Kels/Chil confl.	11/18/03	n	Kels
92	9/29				Chil 23 wk	Kels 2	Kels 3	Kels 3 M	Kels 3 M	Kels 2 M wk	Kels 3 (live)	11/18/03	n	Kels
94	9/29				Chil 29	Chil 51	Kels 1	Kels 1 M	Kels 1 M	Kels 1 M	Kels 1 (live)	11/18/03	n	Kels
4	8/22	Chil 35	Not loc.	Chil 39	Rec.	Rec.	Rec.	Rec.	Rec.	Rec.	37Mi	10/10/03	y	37Mi
27	9/8	Chil 19	Chil 35	Chil 37	37Mi 4 M	37Mi 4	37Mi 4	Rec.	Rec.	Rec.	37Mi	11/21/03	y	37Mi
34	9/10		Not loc.	Chil 35	Kleh 1	37Mi 4	37Mi 4	Rec.	Rec.	Rec.	37Mi	11/21/03	y	37Mi
87	9/26				Chil 27	37Mi 4	37Mi 4 M	Rec.	Rec.	Rec.	37Mi	11/21/03	y	37Mi
72	9/23			Chil 14 Wk	Chil 35	Kleh 2	Kleh 5	Kleh 19	Not in area	Not in area	BeaC	4/5/04	y	BeaC
33	9/10		Chil 31	Kleh 2	Kleh 13	Kleh 11 M	Rec.	Rec.	Rec.	Rec.	Kleh 10	10/30/03	y	Kleh 6
45	9/15		Chil 14	Chil 21	Chil 37	Kleh 6	Kleh 10	Rec.	Rec.	Rec.	Herm	11/28/03	y	Herm
48	9/15		Not loc.	Chil 27	Kleh 6	Kleh 18	Kleh 16	Kleh 16 M	Not in area	Not in area	Kleh at BigB	5/13/04	y	Kleh 11
60	9/19			Chil 27	Chil 35	Kleh 8	Rec.	Rec.	Rec.	Rec.	Herm	11/27/03	y	Herm
63	9/19			Chil 27 wk	Chil 35	Kleh 5	Kleh 5	Chil 35	Chil 35 M	Chil 35 M	Chil 35	4/5/04	n	Kleh 3
107	10/6				Chil 14	Chil 23 LSal 1 M	Chil 21	Chil 24	Chil 26	LSal 3 wk	Kleh 6	2/12/04	y	Kleh 4
11	9/2	Chil 19	Tsir 5	LSal 2	Tsir 3 M	wk	Tsir 3 M	Rec.	Rec.	Rec.	Tsir 3	11/21/03	y	LSal
16	9/3	Chil 26	Chil 26	LSal 1 Wk	LSal 2 Wk	Chil 34	Rec.	Rec.	Rec.	Rec.	Tsir 2	11/6/03	y	LSal
25	9/8	Chil 19	Chil 24	Chil 31	LSal 3	LSal 3	LSal 3	LSal 3 M	LSal 3	LSal 3 M	LSal	11/5/03	n	LSal
44	9/15		Chil 23	Chil 26 wk	Chil 35	Spri	LSal 6	Spri M	Spri M	LSal 5 M wk	Spri	5/20/04	y	Spri

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Fish Number	Date Tagged	Aerial survey locations (river and km upstream from river mouth)									Ground survey location	Ground survey date	Tag recovered	Spawning area
		9-Sep	18-Sep	25-Sep	10-Oct	27-Oct	10-Nov	4-Dec	20-Dec	21-Jan				
47	9/15		Chil 19	Chil 29 Chil 26	Lsal 1 Chil 35	LSal 5	LSal 3 M	LSal 3 M	LSal 3	LSal 3	LSal	11/5/03	n	LSal
53	9/17		Chil 11	Wk	Wk	LSal 5	LSal 5	Lsal 5 M	Lsal 5 M	Lsal 5 M	LSal	3/12/04	y	LSal
56	9/17		Chil 14	Chil 26 wk	LSal 2 wk	LSal 3	LSal 4 M	LSal 4 M	LSal 3 M	LSal 2 wk			n	LSal
59	9/19			Chil 26	Tsir 5	LSal 2 M	LSal 2 M	Rec.	Rec.	Rec.	LSal	11/20/03	y	LSal
68	9/22			Chil 16	LSal 1 wk	LSal 5	LSal 5 M	LSal 5 M	LSal 6 M	LSal 5 M	LSal	5/21/04	y	LSal
85	9/26				Tsir 1	Tsir 5 M	Rec.	Rec.	Rec.	Rec.	LSal (live)	10/20/03	y[a]	LSal
86	9/26				Tsir 4 wk	LSal 4	LSal 3	LSal 5 M	LSal 5 M	LSal 5 M	LSal	5/21/04	y	LSal
99	10/1				Tsir 2	LSal 5	LSal 5	LSal 3 M	Not loc.	LSal 3 M	LSal	3/12/04	y	LSal
114	10/8				Chil 18 Chil Lk	Tsir 5 Chil Lk	LSal 1 Chil Lk	LSal 4 Chil Lk	LSal 5 Chil Lk	LSal 5 M Chil Lk	LSal	3/12/04	y	LSal Chil Lk
54	9/17		Chil 14	Chil 29 wk	NW	NW trib M	NW trib M	NW trib M	NW trib M Chil Lk SE	NW trib M Chil Lk SE			n	NW Chil Lk
62	9/19			Chil 26	Not loc.	Not loc.	SpPd M	SpPd M	M Chil Lk SE	M Chil Lk SE			n	SE Chil Lk
66	9/22			Chil 18 wk	Chil 32	Not loc.	SpPd M	SpPd M Chil Lk	M	M Chil Lk	SpPd	6/17/04	y	SE Chil Lk
89	9/29				Chil 19	Tsir 5 wk Chil Lk	Not loc. Chil Lk	NW Chil Lk	Not loc. Chil Lk NW trib M	NW Chil Lk			n	NW Chil Lk
109	10/6				Chil 23	NW	outlet	NW trib M	wk	NW trib Chil Lk SE			n	NW Chil Lk
111	10/6				Chil 16	Chil 29	Chil Lk SE Chil Lk	Chil Lk SE	Chil Lk SE	wk Chil Lk SE			n	SE Chil Lk
119	10/16					Chil 29	NW	Chil Lk SE	Chil Lk SE	M	SpPd	6/17/04	y	SE
14	9/3	Chil 21	Chil 26	Chil 32 wk	Tsir 5	Tsir 5	Rec.	Rec.	Rec.	Rec.	Clear	11/5/03	y	Clear
108	10/6				Chil 18	Chil 19	Chil 23	Tsir 5	Clear	Tsir 2 M			n	Clear
112	10/8				Chil 14 wk	Not loc.	Chil 31	Tsir 5	Clear	Clear M			n	Clear
113	10/8				Chil 18	Chil 31	Chil 31	Chil 31	Clear	Rec.	Clear	1/16/04	y	Clear
115	10/8				Chil 14 wk	Chil Lk outlet wk	Tsir 5	Chil Lk outlet	Clear	Rec.	Clear	1/16/04	y	Clear

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Fish Number	Date Tagged	Aerial survey locations (river and km upstream from river mouth)									Ground survey location	Ground survey date	Tag recovered	Spawning area
		9-Sep	18-Sep	25-Sep	10-Oct	27-Oct	10-Nov	4-Dec	20-Dec	21-Jan				
116	10/13					Chil 26	Chil 26	Chil 26	Chil 26	Clear	Clear	1/23/04	y	Clear
123	10/20					Chil 31	Chil 31	Clear	Clear M	Rec.	Clear	1/16/04	y	Clear
9	8/27	Chil 27	Chil 40	Chil 45	ECha	ECha	ECha	ECha M	ECha M	Chil 47 M			n	ECha
18	9/3	Chil 26	Chil 45	Chil 45	ECha	ECha	ECha M	ECha M	ECha M	Chil 47 M			n	ECha
24	9/5	Chil 18	Chil 29	Jacq	Musk M	Rec.	Rec.	Rec.	Rec.	Rec.	Musk	10/16/03	y	Musk
17	9/3	Chil 26	Not loc.	Jacq	Kels 1	Jacq	Rec.	Rec.	Rec.	Rec.	Jacq	10/30/03	y	Jacq
30	9/8	Chil 13	Not loc.	Jacq	Jacq	Jacq	Jacq	Jacq M	ECha M BeaF 2 M	ECha	Jacq	11/18/03	n	Jacq
38	9/11		Not loc.	BeaF 1	Jacq	Jacq M	Jacq M	Jacq M	wk	Jacq M	Jacq	10/30/03	n	Jacq
49	9/15		Not loc.	Chil 34	Not loc.	Chil 51	Jacq	Rec.	Rec.	Rec.	Jacq (live)	11/18/03	y	Jacq
52	9/17		Chil 14	Chil 27 wk	Kels 1	Jacq	Jacq M	Jacq M	Jacq M	Jacq M	Jacq (live)	10/29/03	n	Jacq
57	9/17		Chil 14	Chil 45	Rec.	Rec.	Rec.	Rec.	Rec.	Rec.	Jacq	10/9/03	y	Jacq
58	9/17		Chil 13	Chil 21 wk	Jacq wk	Chil 51	Jacq	Rec.	Rec.	Rec.	Jacq	11/18/03	y	Jacq
67	9/22			Chil 16	Chil 39	Jacq	Chil 48	Chil 45	Jacq	Chil 47 M	Chil 30	3/5/04	y	Jacq
79	9/23			Chil 14	Chil 21 wk	Chil 35	Chil 43	Jacq	Jacq M	Jacq			n	Jacq
90	9/29				Chil 21	Chil 51	Jacq	Jacq M	Rec.	Rec.	Jacq	12/9/03	y	Jacq
91	9/29				Chil 23	Chil 48	Chil 40	Jacq	Jacq	Jacq M			n	Jacq
106	10/3				Chil 19	Chil 43	Chil 43	Jacq	Jacq	Chil 39 M			n	Jacq
61	9/19			Chil 19	Chil 13	Takh 13	Takh 11	Takh 10	Not in area	Not in area			n	Takh
75	9/23			Chil 14	Chil 13 wk	Takh 16	Takh 14	Takh 14 M	Not in area	Not in area			n	Takh
76	9/23			Chil 14	Chil 19 wk	Takh 8	Takh 11	Takh 11	Not in area	Not in area			n	Takh
78	9/23			Chil 14	Chil 16	Takh 5	Takh 5 M	Takh 5 M	Not in area	Not in area			n	Takh
96	10/1				Chil 10	Takh 8	Takh 14	Takh 14	Not in area	Not in area			n	Takh
40	9/11		Chil 32	Chil 47 wk	Chil 47 wk	Chil 48	Chil 48	BeaF 3	BeaF 3	Rec.	BeaF	12/29/03	y	BeaF
51	9/17		Chil 11	Chil 21 wk	Chil 43	Chil 47	Chil 45	BeaF 2	BeaF 3 M	Rec.	BeaF	12/29/03	y	BeaF
80	9/26				Chil 45 wk	Jacq	Chil 47	BeaF 3	BeaF 3	Rec.	BeaF	12/29/03	y	BeaF
88	9/26				Chil 34 M	Chil 47	Chil 45	BeaF 3 M	Rec.	Rec.	BeaF	12/12/03	y	BeaF
95	10/1				Chil 24	Chil 43	Chil 40	Chil 47	BeaF 3	BeaF 3	BeaF	3/5/04	y	BeaF
102	10/3				Chil 23 wk	Chil 37	Chil 37	BeaF 3	BeaF 3	Rec.	BeaF	12/29/03	y	BeaF

-continued-

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Fish Number	Date Tagged	Aerial survey locations (river and km upstream from river mouth) 9-Sep	18-Sep	25-Sep	10-Oct	27-Oct	10-Nov	4-Dec	20-Dec	21-Jan	Ground survey location	Ground survey date	Tag recovered	Spawning area
103	10/3				Chil 23 wk	Chil 32	Chil 34	BeaF 3	BeaF 3	Rec.	BeaF	12/29/2003	y	BeaF
105	10/3				Chil 23 wk	Chil 26	Chil 24	Chil 26	Chil 27	BeaF 3 M	BeaF	3/3/2004	y	BeaF
118	10/13					Chil 39	Chil 37	BeaF 3 M	BeaF 3	Rec.	BeaF	12/29/2003	y	BeaF
65	9/22			Chil 11	Chil 19	Chil 26	Chil 23	Chil 24	Chil 26	Chil 24	Chil 24	3/1/2004	n	Chil 15
84	9/26				Chil 23	Chil 23	Chil 23	Chil 23	Chil 23	Chil 23 M	Chil 23	3/1/2004	n	Chil 14
97	10/1				Chil 24	Chil 32	Chil 31	Chil 29	Chil 29 M	Chil 29	Chil 27	2/17/2004	n	Chil 18
98	10/1				Chil 24	Chil 35	Chil 31	Chil 32	Chil 32	Rec.	Chil 32	1/9/2004	y	Chil 20
104	10/3				Chil 19	Chil 23	Chil 23	Chil 23 M	Chil 23 M	Chil 23 M	Chil 23	3/1/2004	n	Chil 14
117	10/13					Chil 19	Chil 18	Chil 27	Chil 27	Not in area	Chil 27	1/6/2004	n	Chil 17
121	10/16					Chil 23	Chil 23	Chil 29	Tsir 3 M wk	Chil 29 M	Chil 27	2/17/2004	y	Chil 17
122	10/20					Chil 29	Chil 27	Chil 29 M	Chil 29 M	Chil 29 M	Chil 27	2/17/2004	y	Chil 17

[a] Tag recovered at Tsirku RKM 3 on 4-Nov.

Abbreviations for Chilkat River drainage locations and water bodies in Appendix A4.

37Mi	37-Mile Creek	Clear	Clear Creek	LSal	Little Salmon
Assg	Assignation Creek	ECha	East Channel Chilkat River (RKM 40-50)	Mule	Mule Meadows
BeaC	Bear Creek	Herm	Herman Creek	Musk	Muskrat Creek
BeaF	Bear Flats	Home	Homestead Creek	Spri	Spring Creek
BigB	Big Boulder Creek	Jacq	Jacquot's Landing (Chilkat River RKM 50-53)	SpPd	Spring Pond outlet stream
Chil	Chilkat River	Kels	Kelsall River	Tahi	Tahini River
Chil Lk	Chilkat Lake	Kleh	Klehini River	Tsir	Tsirku River

Other survey abbreviations in Appendix A4.

Not loca.	Not located during aerial survey	M	Mortality signal detected
Not in area	Known to be outside of area surveyed	wk	Weak signal may indicate low accuracy
Rec.	Transmitter recovered before aerial survey date		

Appendix A5.–Computer files used in the analysis of data for this report.

FILE NAME	DESCRIPTION
02trapsum.xls	Excel workbook containing 2002 Chilkat River coho salmon smolt trapping and coded wire tagging data.
02trapsum.prn	Space delimited text file with raw 2002 Chilkat River coho salmon smolt trapping and coded wire tagging data.
02trapsum.txt	Text file describing heading and column layout in 02trapsum.prn
Smoltawl2002.xls	Excel workbook containing 2002 Chilkat River coho salmon smolt age-weight-length data.
Smoltawl2002.prn	Space delimited text file with raw 2002 Chilkat River coho salmon smolt age-weight-length data.
Smoltawl2002.txt	Text file describing heading and column layout in Smoltawl2002.prn
03FWCohoAges.xls	Excel workbook containing 2003 Chilkat River fish wheel coho salmon catch, marking, and age-length sample data.
03FWCohoAges.prn	Space delimited text file with raw 2003 Chilkat River fish wheel coho salmon catch, marking, and age-length sample data.
03FWCohoAges.txt	Text file describing heading and column layout in 03FWCohoAges.prn
Allcwtrecoveries2003.xls	Excel workbook containing recovery data and harvest estimates of Chilkat River coho salmon tagged as smolt during 2003.
Allcwtrecoveries2003.prn	Space delimited text file with raw recovery data of Chilkat River coho salmon tagged as smolt during 2002.
Allcwtrecoveries2003.txt	Text file describing heading and column layout in Allcwtrecoveries2003.prn
03CohoRadioSurveyLocations.xls	Excel workbook containing 2003 Chilkat River
03CohoRadioSurveyLocations.prn	Space delimited text file with lat/long data from mobile surveys tracking radio tagged Chilkat River coho salmon from September 2003 to June 2004.
03CohoRadioSurveyLocations.txt	Text file describing heading and column layout in 03CohoRadioSurveyLocations.xls
StationaryTrackingTimes.xls	Excel workbook containing 2003 Chilkat River coho salmon radio tag deployment and stationary tracking data.
StationaryTrackingTimes.prn	Space delimited text file with raw 2003 Chilkat River coho salmon radio tag deployment and stationary tracking data.
StationaryTrackingTimes.txt	Text file describing heading and column layout in StationaryTrackingTimes.prn.